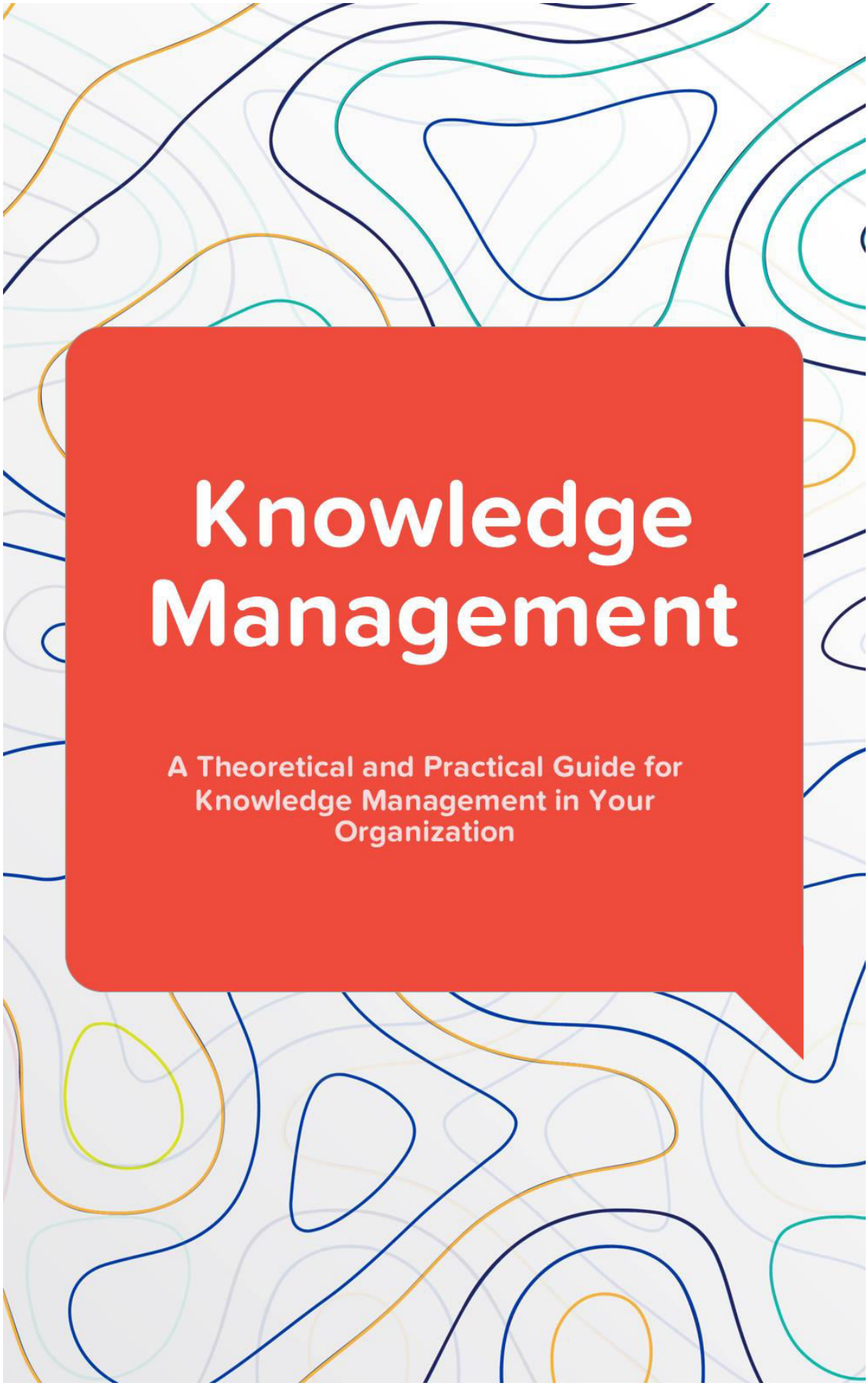
Knowledge Management
A Theoretical and Practical Guide for Knowledge Management in Your Organization

Knowledge Management

System and Practices

A Theoretical and Practical Guide for Knowledge Management in Your Organization

Emil Hajric

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Introduction

This is a knowledge management book covering the theories, frameworks, models, tools, and supporting disciplines that are relevant to both the student and the practitioner. The goal of this book is to provide a comprehensive overview of knowledge management by examining its objectives, scope, strategy, best practices, knowledge management tools, and so on. The book is structured very much like a textbook, with introductory concepts at the top, more subject-specific discussions in the latter half.

Introducing Knowledge Management

Knowledge management is essentially about getting the right knowledge to the right person at the right time. This in itself may not seem so complex, but it implies a strong tie to corporate strategy, understanding of where and in what forms knowledge exists, creating processes that span organizational functions, and ensuring that initiatives are accepted and supported by organizational members. Knowledge management may also include new knowledge creation, or it may solely focus on knowledge sharing, storage, and refinement. For a more comprehensive discussion and definition, see my knowledge management definition.

It is important to remember that knowledge management is not about managing knowledge for knowledge's sake. The overall objective is to create value and leverage and refine the firm's knowledge assets to meet organizational goals.

Implementing knowledge management thus has several dimensions including:

Strategy: Knowledge management strategy must be dependent on corporate strategy. The objective is to manage, share, and create relevant knowledge assets that will help meet tactical and strategic requirements.

Organizational Culture: The organizational culture influences the way people interact, the context within which knowledge is created, the resistance they will have towards certain changes, and ultimately the way they share (or the way they do not share) knowledge.

Organizational Processes: The right processes, environments, and systems that enable KM to be implemented in the organization.

Management & Leadership: KM requires competent and experienced leadership at all levels. There are a wide variety of KM-related roles that an organization may or may not need to implement, including a CKO, knowledge

managers, knowledge brokers and so on. More on this in the section on KM positions and roles.

Technology: The systems, tools, and technologies that fit the organization's requirements - properly designed and implemented.

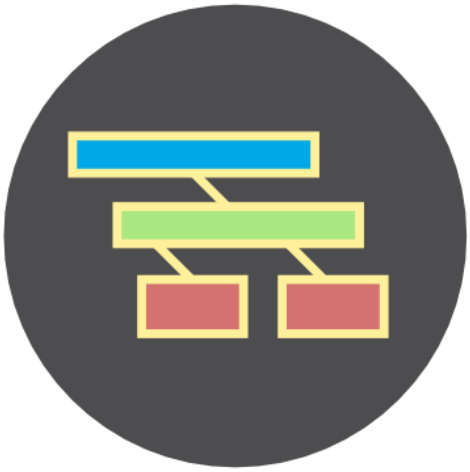
Politics: The long-term support to implement and sustain initiatives that involve virtually all organizational functions, which may be costly to implement (both from the perspective of time and money), and which often do not have a directly visible return on investment.

In the past, failed initiatives were often due to an excessive focus on primitive knowledge management tools and systems, at the expense of other areas. While it is still true that KM is about people and human interaction, KM systems have come a long way and have evolved from being an optional part of KM to a critical component. Today, such systems can allow for the capture of unstructured thoughts and ideas, can create virtual conferencing allowing close contact between people from different parts of the world, and so on. This issue will also be addressed throughout the site, and particularly in the knowledge management strategy section.

At this point, the articles presented on this site focus on the first five dimensions. For now, at least, the political dimension is beyond the scope of this site.

Throughout the site, I will explain and discuss known theories, occasionally contributing with some of my own frameworks. I will also discuss the potential role of knowledge management systems from a broad perspective, and in the section on KM tools I will provide specific advice on this topic. I have tried to organize the site as logically as possible, moving from a general introduction to knowledge and KM to introducing key subjects like organizational memory, learning, and culture. The later sections discuss several models and frameworks as well as knowledge management initiatives, strategy, and systems, before finally presenting an overview of various tools and techniques.

Knowledge, Information and Data



Defining Knowledge, Information, Data

Before one can begin to talk about knowledge management (KM), one must start by clearly defining the meaning of the word "knowledge". It is important to understand what constitutes knowledge and what falls under the category of information or data. Unfortunately, this is a more difficult task than may be apparent at first. Within everyday language, within specific fields, and even within the same disciplines, the word "knowledge" often takes on a variety of meanings.

Perspectives on Knowledge, Information, Data

In everyday language we use knowledge all the time. Sometimes we mean know-how, while other times we are talking about wisdom. On many occasions we even use it to refer to information. Part of the difficulty of defining knowledge arises from its relationship to two other concepts, namely data and information. These two terms are often regarded as lower denominations of knowledge, but the exact relationship varies greatly from one example to another.

Within more technologically oriented disciplines- particularly involving information systems- knowledge is often treated very similarly to information. It is seen as something one can codify and transmit, and where IT plays a pivotal role in knowledge sharing. For instance, the encyclopedia at fact-archive.com defines it as: "information that has a purpose or use."

This kind of simplistic view of knowledge was particularly widespread during the 90s when information technology became increasingly more common. However even today, some KM systems are little more than information management systems using knowledge as a virtual synonym for information.

To illustrate, Theirauf (1999) defines the three components as follows: data is the lowest point, an unstructured collection of facts and figures; information is the next level, and it is regarded as structured data; finally, knowledge is defined as "information about information".

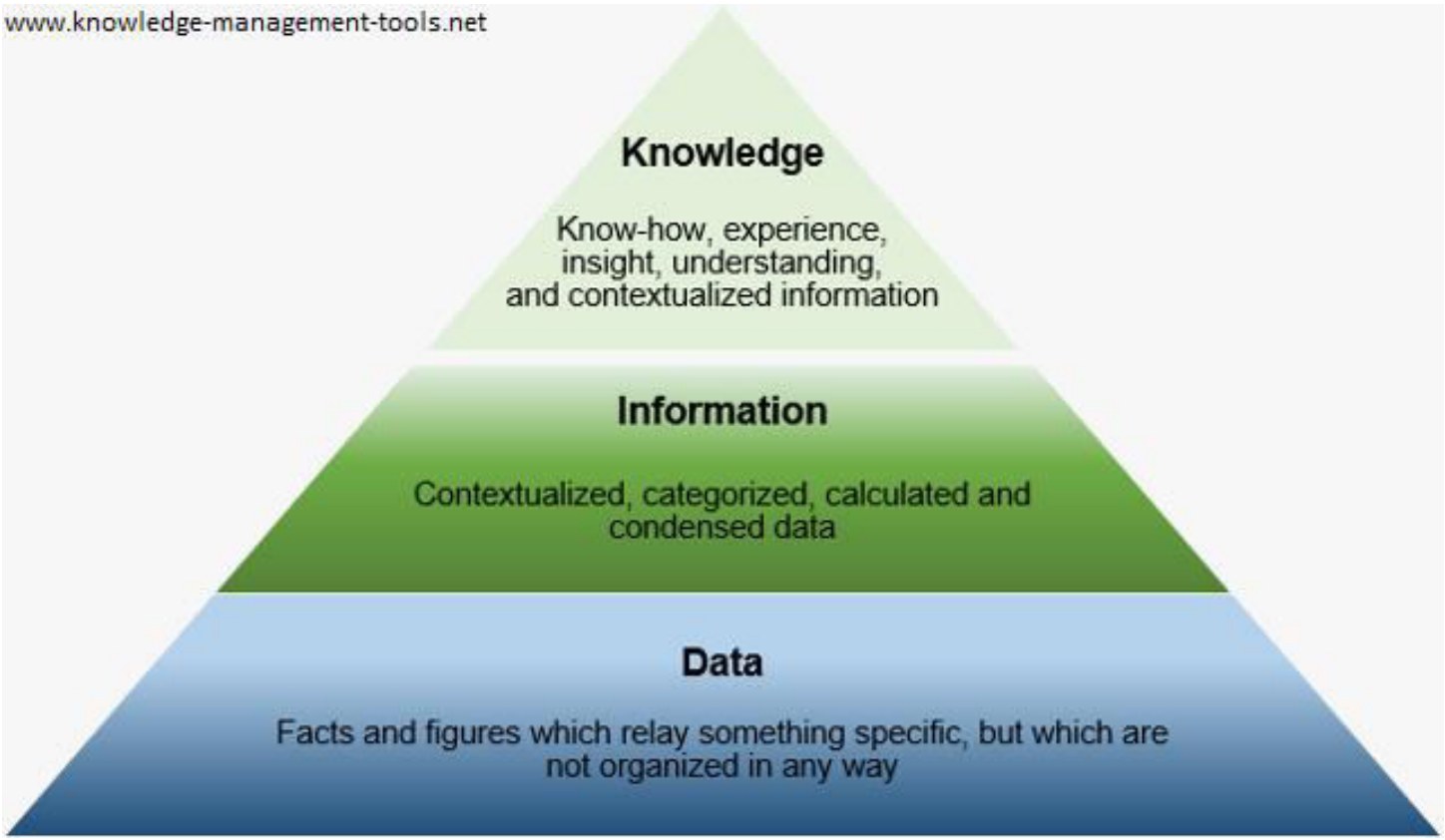
However, increasingly one sees definitions that treat knowledge as a more complex and personal concept that incorporate more than just information. The

Longman online dictionary has one definition that begins to approach the way that knowledge is usually regarded within KM. It states "the information, skills, and understanding that you have gained through learning or experience." Although still closely associated with information, concepts like skills, understanding, and experience begin to surface.

Defining Data, Information, and Knowledge

Here, I have included the definitions that will be used throughout this book.

Data: Facts and figures which relay something specific, but which are not



organized in any way and which provide no further information regarding patterns, context, etc. I will use the definition for data presented by Thierauf (1999): "unstructured facts and figures that have the least impact on the typical manager."

Information: For data to become information, it must be contextualized, categorized, calculated and condensed (Davenport & Prusak 2000). Information thus paints a bigger picture; it is data with relevance and purpose (Bali et al 2009). It may convey a trend in the environment, or perhaps indicate a pattern of sales

for a given period of time. Essentially information is found "in answers to questions that begin with such words as who, what, where, when, and how many" (Ackoff 1999).

IT is usually invaluable in the capacity of turning data into information, particularly in larger firms that generate large amounts of data across multiple departments and functions. The human brain is mainly needed to assist in contextualization.

Knowledge: Knowledge is closely linked to doing and implies know-how and understanding. The knowledge possessed by each individual is a product of his experience and encompasses the norms by which he evaluates new inputs from his surroundings (Davenport & Prusak 2000). I will use the definition presented by Gamble and Blackwell (2001), based closely on a previous definition by Davenport & Prusak:

"Knowledge is a fluid mix of framed experience, values, contextual information, expert insight, and grounded intuition that provides an environment and framework for evaluating and incorporating new experiences and information. It originates and is applied in the mind of the knowers. In organizations it often becomes embedded not only in documents or repositories, but also in organizational routines, practices and norms."

In order for KM to succeed, one needs a deep understanding of what constitutes knowledge. Now that we have set clear boundaries between knowledge, information, and data, it is possible to go one step further and look at the forms in which knowledge exists and the different ways that it can be accessed, shared, and combined. I will discuss this in the section titled "The Different Kinds of Knowledge".

The Different Types of Knowledge

Understanding the different forms that knowledge can exist in, and thereby being able to distinguish between various types of knowledge, is an essential step for knowledge management (KM). For example, it should be fairly evident that the knowledge captured in a document would need to be managed (i.e. stored, retrieved, shared, changed, etc.) in a totally different way than that gathered over the years by an expert craftsman.

Over the centuries many attempts have been made to classify knowledge, and different fields have focused on different dimensions. This has resulted in numerous classifications and distinctions based in philosophy and even religion. Though not directly related to our purpose here, the Wikipedia article on knowledge provides some interesting background reading (go to article).

Within business and KM, two types of knowledge are usually defined, namely explicit and tacit knowledge. The former refers to codified knowledge, such as that found in documents, while the latter refers to non-codified and often personal/experience-based knowledge.

KM and organizational learning theory almost always take root in the interaction and relationship between these two types of knowledge. This concept has been introduced and developed by Nonaka in the 90's (e.g. Nonaka 1994) and remains a theoretical cornerstone of this discipline. Botha et al (2008) point out that tacit and explicit knowledge should be seen as a spectrum rather than as definitive points. Therefore, in practice, all knowledge is a mixture of tacit and explicit elements rather than being one or the other. However, in order to understand knowledge, it is important to define these theoretical opposites.

Some researchers make a further distinction and talk of embedded knowledge. This way, one differentiates between knowledge embodied in people and that embedded in processes, organizational culture, routines, etc. (Horvath 2000). Gamble and Blackwell (2001) use a scale consisting of represented-embodied-embedded knowledge, where the first two closely match the explicit-tacit.

Without question, the most important distinction within KM is between explicit and tacit knowledge. However, I find that the embedded dimension is a valuable addition, since the managerial requirements for this type of knowledge are quite different. For this reason, the discussions on this site will, when relevant, use all three categorizations of knowledge but the focus will always be primarily on the explicit-tacit dimension.

Below I present an overview of these three categories, as well as a short discussion on the way knowledge management systems (KMS) can/cannot be used to manage them.

Explicit Knowledge

This type of knowledge is formalized and codified and is sometimes referred to as know-what (Brown & Duguid 1998). It is therefore fairly easy to identify, store, and retrieve (Wellman 2009). This is the type of knowledge most easily handled by KMS, which are very effective at facilitating the storage, retrieval, and modification of documents and texts.

From a managerial perspective, the greatest challenge with explicit knowledge is similar to information. It involves ensuring that people have access to what they need; that important knowledge is stored; and that the knowledge is reviewed, updated, or discarded.

Many theoreticians regard explicit knowledge as being less important (e.g. Brown & Duguid 1991, Cook & Brown 1999, Bukowitz & Williams 1999, etc.). It is considered simpler in nature and cannot contain the rich experience-based know-how that can generate lasting competitive advantage.

Although this is changing to some limited degree, KM initiatives driven by technology have often had the flaw of focusing almost exclusively on this type of knowledge. As discussed previously, in fields such as IT there is often a lack of a more sophisticated definition. This has therefore created many products labeled as KM systems, which in actual fact are/were nothing more than information and explicit knowledge management software.

Explicit knowledge is found in: databases, memos, notes, documents, etc. (Botha et al. 2008)

Tacit Knowledge

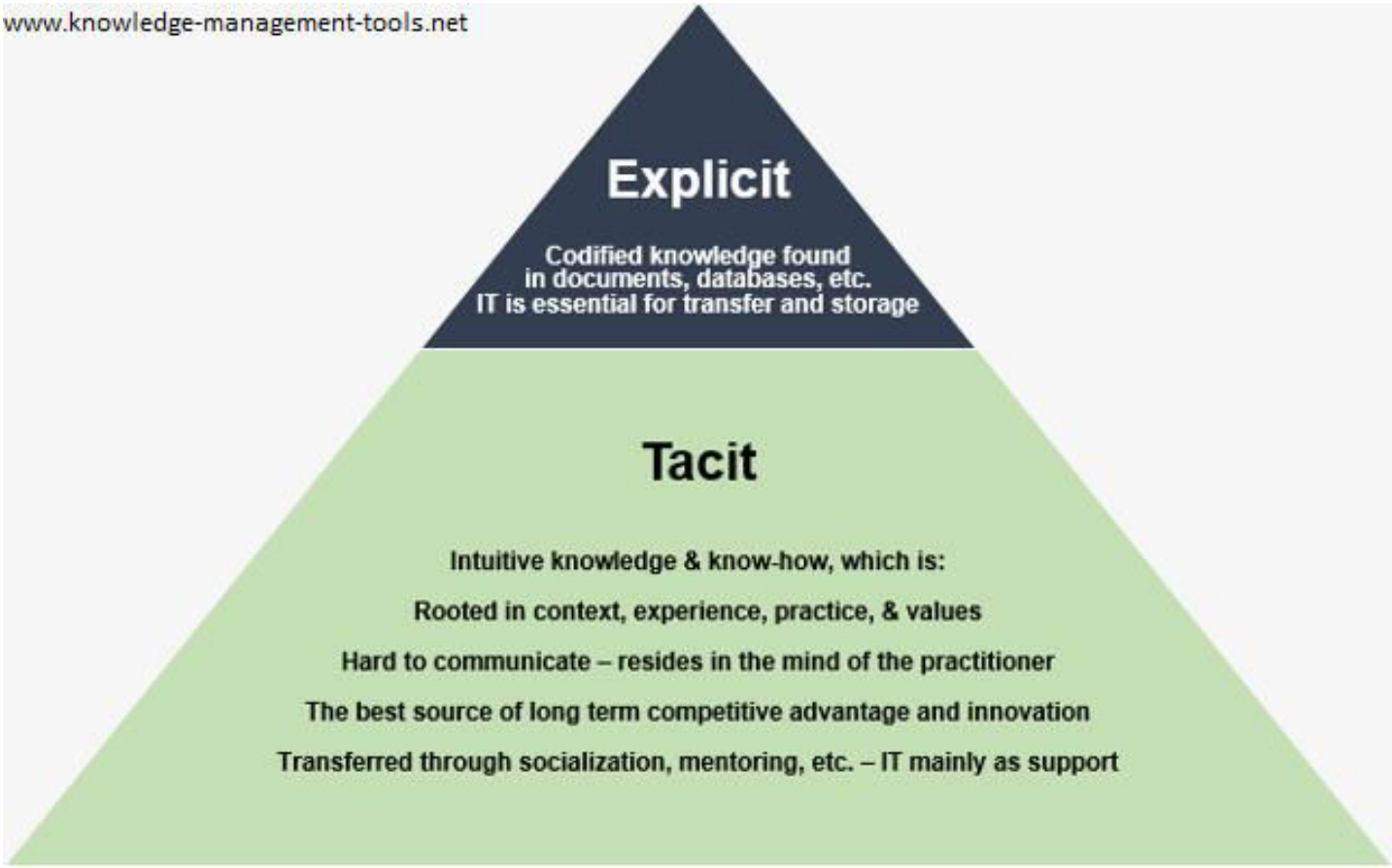
This type of knowledge was originally defined by Polanyi in 1966. It is sometimes referred to as know-how (Brown & Duguid 1998) and refers to intuitive, hard to define knowledge that is largely experience based. Because of this, tacit knowledge is often context dependent and personal in nature. It is hard to communicate and deeply rooted in action, commitment, and involvement (Nonaka 1994).

Tacit knowledge is also regarded as being the most valuable source of knowledge, and the most likely to lead to breakthroughs in the organization (Wellman 2009). Gamble & Blackwell (2001) link the lack of focus on tacit knowledge directly to the reduced capability for innovation and sustained competitiveness.

KMS have a very hard time handling this type of knowledge. An IT system relies on codification, which is something that is difficult/impossible for the tacit knowledge holder.

Using a reference by Polanyi (1966), imagine trying to write an article that would accurately convey how one reads facial expressions. It should be quite apparent that it would be near impossible to convey our intuitive understanding gathered from years of experience and practice. Virtually all practitioners rely on this type of knowledge. An IT specialist for example will troubleshoot a problem based on his experience and intuition. It would be very difficult for him to codify his knowledge into a document that could convey his know-how to a beginner. This is one reason why experience in a particular field is so highly regarded in the job market.

The exact extent to which IT systems can aid in the transfer and enhancement of



tacit knowledge is a rather complicated discussion. For now, suffice it to say that successful KM initiatives must place a very strong emphasis on the tacit dimension, focusing on the people and processes involved, and using IT in a supporting role.

Tacit knowledge is found in: the minds of human stakeholders. It includes cultural beliefs, values, attitudes, mental models, etc. as well as skills, capabilities and expertise (Botha et al 2008). On this site, I will generally limit tacit knowledge

to knowledge embodied in people and refer separately to embedded knowledge (as defined below), whenever making this distinction is relevant.

Embedded Knowledge

Embedded knowledge refers to the knowledge that is locked in processes, products, culture, routines, artifacts, or structures (Horvath 2000, Gamble & Blackwell 2001). Knowledge is embedded either formally, such as through a management initiative to formalize a certain beneficial routine, or informally as the organization uses and applies the other two knowledge types.

The challenges in managing embedded knowledge vary considerably and will often differ from embodied tacit knowledge. Culture and routines can be both difficult to understand and hard to change. Formalized routines on the other hand may be easier to implement and management can actively try to embed the fruits of lessons learned directly into procedures, routines, and products.

IT's role in this context is somewhat limited but it does have some useful applications. Broadly speaking, IT can be used to help map organizational knowledge areas; as a tool in reverse engineering of products (thus trying to uncover hidden embedded knowledge); or as a supporting mechanism for processes and cultures. However, it has also been argued that IT can have a disruptive influence on culture and processes, particularly if implemented improperly.

Due to the difficulty in effectively managing embedded knowledge, firms that succeed may enjoy a significant competitive advantage.

Embedded knowledge is found in: rules, processes, manuals, organizational culture, codes of conduct, ethics, products, etc. It is important to note, that while embedded knowledge can exist in explicit sources (i.e. a rule can be written in a manual), the knowledge itself is not explicit, i.e. it is not immediately apparent why doing something this way is beneficial to the organization.

What is Knowledge Management?

The full scope of knowledge management (KM) is not something that is universally accepted. However, before one looks at the differences in the definitions, let's the similarities.

KM is about making the right knowledge available to the right people. It is about making sure that an organization can learn, and that it will be able to retrieve and use its knowledge assets in current applications as they are needed. In the words of Peter Drucker it is "the coordination and exploitation of organizational knowledge resources, in order to create benefit and competitive advantage" (Drucker 1999).

Where the disagreement sometimes occurs is in conjunction with the creation of new knowledge. Wellman (2009) limits the scope of KM to lessons learned and the techniques employed for the management of what is already known. He argues that knowledge creation is often perceived as a separate discipline and generally falls under innovation management.

Bukowitz and Williams (1999) link KM directly to tactical and strategic requirements. Its focus is on the use and enhancement of knowledge-based assets to enable the firm to respond to these issues. According to this view, the answer to the question "what is knowledge management" would be significantly broader.

A similarly broad definition is presented by Davenport & Prusak (2000), which states that KM "is managing the corporation's knowledge through a systematically and organizationally specified process for acquiring, organizing, sustaining, applying, sharing and renewing both the tacit and explicit knowledge of employees to enhance organizational performance and create value."

I will also choose to answer the question "what is knowledge management" in the broader perspective, encompassing not just the exploitation and management of existing knowledge assets, but the also the initiatives involved in the creation and acquisition of new knowledge. In the next article, I will arrive at a specific knowledge management definition.

Knowledge Management Definition

Based on the discussion in the previous section, my knowledge management definition is as follows:

Knowledge management is the systematic management of an organization's knowledge assets for the purpose of creating value and meeting tactical & strategic requirements; it consists of the initiatives, processes, strategies, and systems that sustain and enhance the storage, assessment, sharing, refinement, and creation of knowledge.

Knowledge management (KM) therefore implies a strong tie to organizational goals and strategy, and it involves the management of knowledge that is useful for some purpose and which creates value for the organization.

Expanding upon the previous knowledge management definition, KM involves the understanding of:

Where and in what forms knowledge exists; what the organization needs to know; how to promote a culture conducive to learning, sharing, and knowledge creation; how to make the right knowledge available to the right people at the right time; how to best generate or acquire new relevant knowledge; how to manage all of these factors so as to enhance performance in light of the organization's strategic goals and short-term opportunities and threats.

KM must therefore create/provide the right tools, people, knowledge, structures (teams, etc.), culture, etc. so as to enhance learning; it must understand the value and applications of the new knowledge created; it must store this knowledge and make it readily available for the right people at the right time; and it must continuously assess, apply, refine, and remove organizational knowledge in conjunction with concrete long and short-term factors.

From this knowledge management definition, we can see that it depends upon the management of the organization's knowledge creation and conversion mechanisms; organizational memory and retrieval facilities; organizational

learning; and organizational culture. These concepts will be explored in more detail in the following sections.

Why is Knowledge Management Useful?

I have been asked to write this piece by someone who was not entirely familiar with the knowledge management (KM) discipline. Looking back at the work I presented on this site, I can see how a beginner, and particularly a manager new to the subject, might not easily understand why knowledge management is useful for their particular situation.

I will keep this concise and to the point. Knowledge management is responsible for understanding:

- What your organization knows.
- Where this knowledge is located, e.g. in the mind of a specific expert, a specific department, in old files, with a specific team, etc.
- In what form this knowledge is stored e.g. the minds of experts, on paper, etc.
- How to best transfer this knowledge to relevant people, so as to be able to take advantage of it or to ensure that it is not lost. E.g. setting up a mentoring relationship between experienced experts and new employees, implementing a document management system to provide access to key explicit knowledge.
- The need to methodically assess the organization's actual know-how vs the organization's needs and to act accordingly, e.g. by hiring or firing, by promoting specific in-house knowledge creation, etc.

So, why is knowledge management useful? It is useful because it places a focus on knowledge as an actual asset, rather than as something intangible. In so doing, it enables the firm to better protect and exploit what it knows, and to improve and focus its knowledge development efforts to match its needs.

In other words:

- It helps firms learn from past mistakes and successes.
- It better exploits existing knowledge assets by re-deploying them in areas where the firm stands to gain something, e.g. using knowledge from one

department to improve or create a product in another department, modifying knowledge from a past process to create a new solution, etc.

- It promotes a long-term focus on developing the right competencies and skills and removing obsolete knowledge.
- It enhances the firm's ability to innovate.
- It enhances the firm's ability to protect its key knowledge and competencies from being lost or copied.

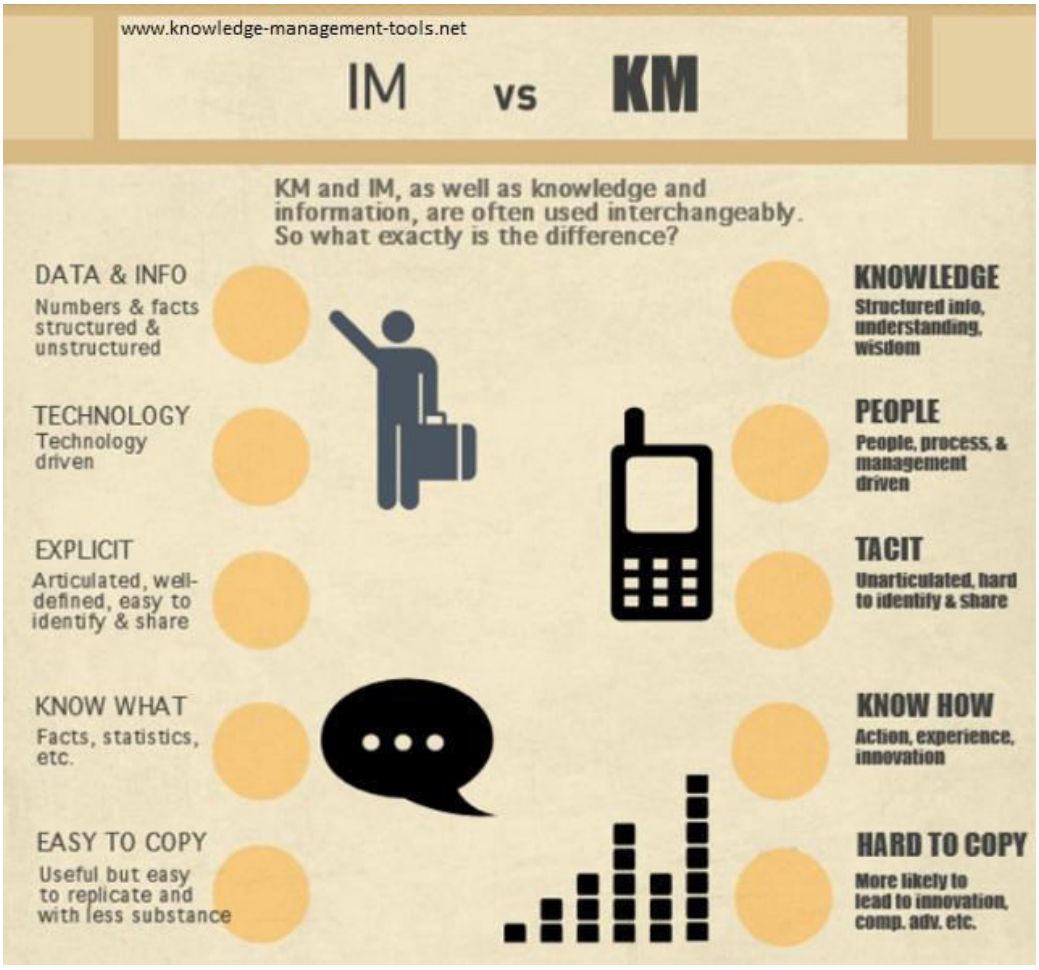
Unfortunately, KM is an area in which companies are often reluctant to invest because it can be expensive to implement properly, and it is extremely difficult to determine a specific ROI. Moreover, KM is a concept the definition of which is not universally accepted, and for example within IT one often sees a much shallower, information-oriented approach. Particularly in the early days, this has led to many "KM" failures and these have tarnished the reputation of the subject as a whole. Sadly, even today, probably about one in three blogs that I read on this subject have absolutely nothing to do with the KM that I was taught back in business school. I will discuss this latter issue in greater detail in the future.

discuss this latter issue in greater detail in the future.

Information Management vs Knowledge Management

This has always been a bit of a tricky subject, because knowledge and information are used interchangeably by so many people. Therefore, you will often find KM solutions even today which are essentially nothing more than information or document management systems, i.e. which handle data, information, or perhaps even explicit knowledge, but which do not touch the most essential part of KM - tacit knowledge.

Below you can find an infographic of the main differences, with a short explanation below. Please keep in mind that IM in many ways is a useful tool for KM, in that information can help create and refine knowledge, but as a discipline it is a different one.



As I showed in the previous sections, knowledge and information are actually quite different, as is tacit and explicit knowledge. So, while information and data management are certainly very useful, particularly as information sources are growing at exponential rates and with the new focus on big data, it is not synonymous with KM.

So, what exactly is the difference?

Information and IM:

- Focus on data and information
- Deal with unstructured and structured facts and figures.
- Benefit greatly from technology, since the information being conveyed is already codified and in an easily transferrable form.
- Focus on organizing, analyzing, and retrieving - again due to the codified nature of the information.
- Is largely about know-what, i.e. it offers a fact that you can then use to help create useful knowledge, but in itself that
- fact does not convey a course of action (e.g. sales of product x are up 25% last quarter).
- Is easy to copy - due to its codified and easily transferrable nature.

Knowledge and KM:

- Focus on knowledge, understanding, and wisdom
- Deal with both codified and uncodified knowledge. Uncodified knowledge - the most valuable type of knowledge - is found in the minds of practitioners and is unarticulated, context-based, and experience-based.
- Technology is extremely useful, but KM's focus is on people and processes. IT is great for transferring explicit, codified knowledge, but it's role in the transfer of deeper, internalized knowledge is more complex. Since this kind of knowledge is passed from person to person, through interaction, collaboration, mentoring, etc. and preferably in an unstructured

environment, IT tools for KM have to support this function. They are therefore not merely passing on information, but also act as tools to bring people together, to enhance communication, to allow the storage and transfer of unstructured thoughts and notes, etc.

- Focus on locating, understanding, enabling, and encouraging - by creating environments, cultures, processes, etc. where knowledge is shared and created.
- Is largely about know-how, know-why, and know-who
- Is hard to copy - at least regarding the tacit elements. The connection to experience and context makes tacit knowledge extremely difficult to copy. This is why universities cannot produce seasoned practitioners - there are some things (the most important things) that you simply cannot teach from a textbook (or other codified source of information/explicit knowledge). These are learnt in the field and understood on an intuitive level. You cannot easily copy or even understand this intuition without the right experience, context, etc. - and it is this intuition that represents the most valuable organizational knowledge.

Organizational Knowledge

Introducing Organizational Knowledge

In an earlier section we identified the three different types of knowledge that can exist in an organization. Now I will take a closer look at the scope organizational knowledge and its significance to the knowledge management (KM) process.

Organizational Knowledge Resources

Business knowledge can exist on several different levels:

Individual: Personal, often tacit knowledge/know-how of some sort. It can also be explicit, but it must be individual in nature, e.g. a private notebook.

Groups/community: Knowledge held in groups but not shared with the rest of the organization. Companies usually consist of communities (most often informally created) which are linked together by common practice. These communities of practice (Lave & Wenger 1991) may share common values, language, procedures, know-how, etc. They are a source of learning and a repository for tacit, explicit, and embedded knowledge.

Structural: Embedded knowledge found in processes, culture, etc. This may be understood by many or very few members of the organization. E.g. the knowledge embedded in the routines used by the army may not be known by the soldiers who follow these routines. At times, structural knowledge may be the remnant of past, otherwise long forgotten lessons, where the knowledge of this lesson exists exclusively in the process itself.

Organizational: The definition of organizational knowledge is yet another concept that has very little consensus within literature. Variations include the extent to which the knowledge is spread within the organization, as well as the actual make-up of this knowledge. Hatch (2010) defines it as: "When group knowledge from several subunits or groups is combined and used to create new

knowledge, the resulting tacit and explicit knowledge can be called organizational knowledge."

Others present a broader perspective: "individual knowledge, shared knowledge, and objectified knowledge are different aspects or views of organizational knowledge" (Ekinge & Lennartsson 2000). As always, texts emphasizing an IT based outlook once again offer shallower, information-based definitions, e.g. Virvou & Nakamura 2008, "Information internalized by means of research, study or experience that has value to the organization".

For the purpose of this site I will adopt a broad, knowledge-based perspective. Organizational knowledge is therefore defined as: *all the knowledge resources within an organization that can be realistically tapped by that organization.* It can therefore reside in individuals and groups or exist at the organizational level.

Extra-organizational: Defined here as: Knowledge resources existing outside the organization which could be used to enhance the performance of the organization. They include explicit elements like publications, as well as tacit elements found in communities of practice that span beyond the organization's borders.

Implications for KM

In order to enhance organizational knowledge, KM must therefore be involved across the entire knowledge spectrum. It must help knowledge development at all levels and facilitate & promote its diffusion to individuals, groups, and/or across the entire firm, in accordance with the organization's requirements. KM must manage organizational knowledge storage and retrieval capabilities and create an environment conducive to learning and knowledge sharing. Similarly, it must be involved in tapping external sources of knowledge whenever these are necessary for the development of the organizational knowledge resources.

To a large degree, KM is therefore dependent on the understanding and management of organizational learning, organizational memory, knowledge sharing, knowledge creation, and organizational culture.

The SECI Model and Knowledge Conversion

Arguably the most important contributor to this subject has been Ikujiro Nonaka. He worked extensively with the concepts of explicit knowledge and tacit knowledge and drew attention to the way Western firms tend to focus too much on the former (Nonaka & Takeuchi 1996). This sentiment has since been echoed throughout organisational learning and knowledge management (KM) literature (e.g. Cook & Brown 1999, Kreiner 1999, Tsoukas & Valdimirou 2001, etc.).

Nonaka and Takeuchi introduced the SECI model (Nonaka & Takeuchi 1996) which has become the cornerstone of knowledge creation and transfer theory. They proposed four ways that knowledge types can be combined and converted, showing how knowledge is shared and created in the organization. The model is based on the two types of knowledge outlined above.

Socialization: Tacit to tacit. Knowledge is passed on through practice, guidance, imitation, and observation.

Externalization: Tacit to explicit. This is deemed as a particularly difficult and often particularly important conversion mechanism. Tacit knowledge is codified into documents, manuals, etc. so that it can spread more easily through the organization. Since tacit knowledge can be virtually impossible to codify, the extent of this knowledge conversion mechanism is debatable. The use of metaphor is cited as an important externalization mechanism.

Combination: Explicit to explicit. This is the simplest form. Codified knowledge sources (e.g. documents) are combined to create new knowledge.

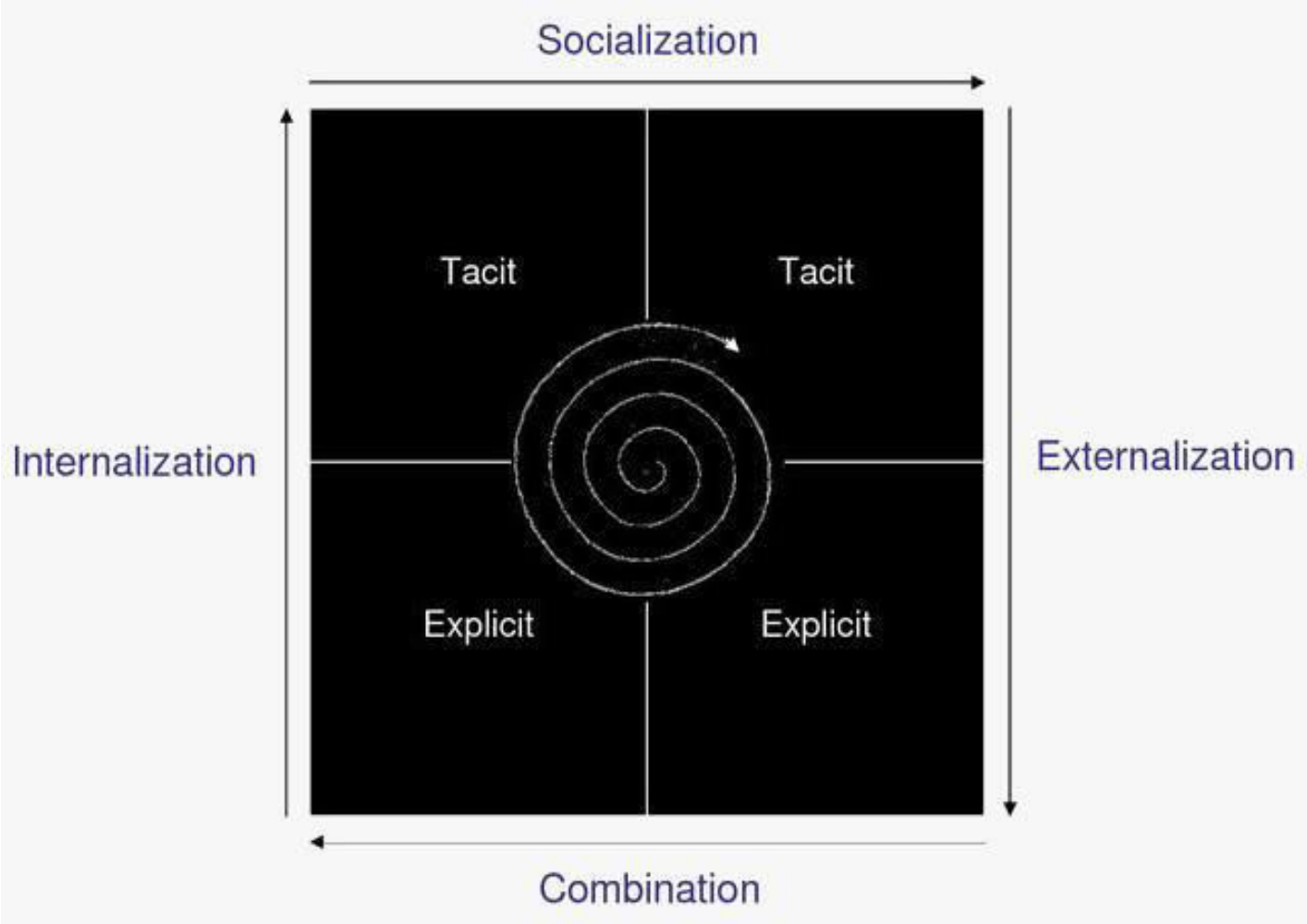
Internalization: Explicit to tacit. As explicit sources are used and learned, the knowledge is internalized, modifying the user's existing tacit knowledge.

The SECI Model Knowledge Creation Spiral

In this model, knowledge is continuously converted and created as users practice, collaborate, interact, and learn. The process should be seen as a continuous, dynamic, swirl of knowledge rather than a static model. It is basically a

visual representation of overlapping, continuous processes that take place - or should take place - in an organization.

Below I have included a graphical representation of this concept as presented in the SECI model:



A great deal of effort has been put into investigating its practical applicability (with mixed results), but in recent years the applicability of the model has been linked strongly to culture, both organizational and national. The issue is whether culture is more than just an element in a KM model, i.e. culture-in-the-model, but rather acts as a limiting factor for a model, i.e. culture-of-the-model (Andreeva & Ikhilchik 2011). The issue of culture as a limiting factor for KM models is an issue I will incorporate into the site in the future and provide a link from this article to the new sections.

Nonetheless, the SECI model remains at the core of knowledge conversion theory within KM, and this almost universal attraction to the model may in itself be an indication that some aspects of it appeal to virtually all cultures (Andreeva & Ikhilchik 2011).

Organizational Memory and Knowledge Repositories

Traditional memory is associated with the individual's ability to acquire, retain, and retrieve knowledge. Within business this concept is extended beyond the individual, and organizational memory therefore refers to the collective ability to store and retrieve knowledge and information.

So how does one define organizational memory? Any definition would need to span all the different repositories in which a company may store knowledge. This includes the more formal records, as well as tacit and embedded knowledge located in people, organizational culture, and processes.

Walsh and Ungson (1991) offer some deeper insight into the workings of organizational memory. They look at how and organization's history can influence current decision making. They how shared understandings evolve, becoming part of an organizational whole which may remain constant even after key individuals have left the firm. This is done through the formation of collective interpretations regarding the outcome of decision making. The information defining the decision's stimulus and response is stored in information, and it affects present decisions when it is retrieved.

Walsh and Ungson (1991) define a number of stages in the organizational memory process and outline five retention facilities:

- Acquisition: Organizational memory consists of the accumulated information regarding past decisions. This information is not centrally stored, but rather it is split across different retention facilities. Each time a decision is made, and the consequences are evaluated, some information is added to the organizational memory.
- Retention: Past experiences can be retained in any of the five different repositories:
  - Individuals
  - Culture: The language and frameworks that exist within an organization and form shared interpretations.

- Transformations: The procedures and formalized systems that the organization employs. These systems reflect the firm's past experiences and are repositories for embedded knowledge.
- Structures: These link the individual to other individuals and to the environment. Social interaction is conditioned by mutual expectations between individuals based on their roles within the organization. The interaction sequences for a pattern over time and begin to extend to an organizational level. This can take place both through formal and informal structure and it constitutes a social memory which stores information about an organization's perception of the environment.
- External activities: The surroundings of the organization where knowledge and information can be stored. E.g. former employees, government bodies, competitors, etc.

- Retrieval: This can either be controlled or automatic. The latter refers to the intuitive and essentially effortless process of accessing organizational memory, usually as part of an established sequence of action. Controlled refers to the deliberate attempt to access stored knowledge.

As one can see, the three stages presented here are essential to the learning process of the firm. Much like an individual, the firm must be able to access and use past experiences so as to avoid repeating mistakes and to exploit valuable knowledge. Unlike an individual however, OM is not centrally stored and resides throughout the firm and even beyond it. The process of retrieving knowledge/information will inevitably vary depending on the retention facility that one is trying to access. For example, written documentation may be accessed through IT while cultural memory is accessed through the understanding and/or application of the norms and procedures of the working environment.

A further distinction regarding the type of knowledge retained in the organization is offered by Ramage and Reif (1996). They separate the documented aspects from the subtler knowledge that belongs to individuals as a result of their role as members of the organization:

- Artifacts of Cooperation: These are the hard indicators which are visible and examinable. They include products, records of collaboration, and ideas. The latter refers to minutes of meetings, reports, FAQs, and other

items that record common knowledge. These are easily storable and presumably also more easily accessible.

- Knowledge of the Organization Qua Entity: This type of knowledge cannot be stored in the same way as the artifacts of cooperation. It includes knowledge of the political system, of the culture, and of how things are normally done within the firm. It can include the knowledge of who is an expert, of where a particular person is, and on who to contact for a specific problem.

This definition is useful as a way of understanding the knowledge categories and the potential management challenge that organizational memory, and ultimately knowledge management (KM) would pose.

Furthermore, as is the case with many KM related disciplines, one finds a distinct difference in the way organizational memory is perceived between IT practitioners and business theoreticians. In the words of Wellman (2009): "The IT path emphasizes the acquisition and storage of organizational knowledge including data warehousing, document management, and search tools. The organization development (OD) path emphasizes tacit knowledge, coaching, social interactions, and encouraging ad hoc knowledge exchange."

IT based models thus tend to focus on more concrete, definable memory and less on people, culture, and informal structures. Essentially, they focus more on artifacts of cooperation.

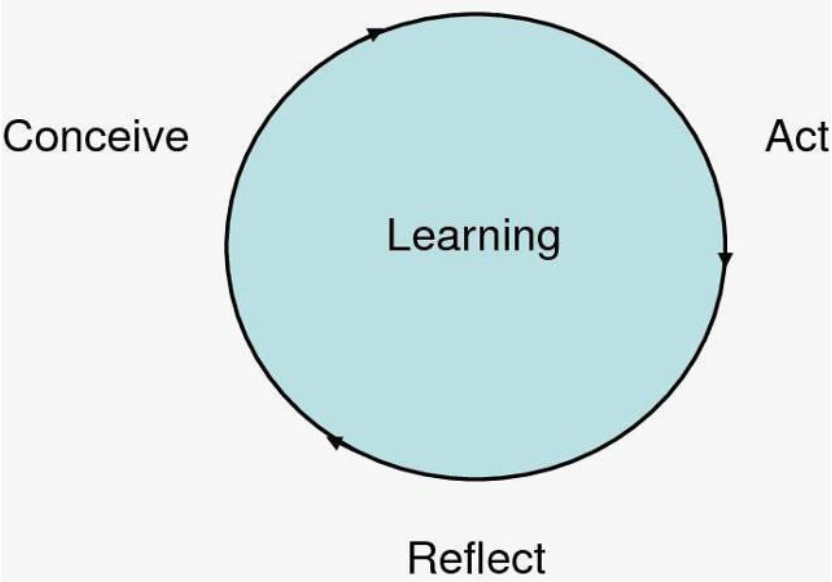
Since this site deals with organizational memory within the context of KM, it is not necessary to arrive at a specific definition or model. Instead it is important to understand the scope of organizational memory, its varied and often complex retention facilities, and the types of knowledge available. In later sections, I will investigate more closely the specific role that IT can have in supporting, promoting, and enhancing organizational memory.

Organizational Learning

Introducing Organizational Learning

What is Organizational Learning?

Learning is the way we create new knowledge and improve ourselves. Although there is ample debate regarding the mechanisms and scope of learning, in its simplest form this is no different for organizations. Botha et al. describe the organizational learning process as follows:



As one can see organizational learning is based on applying knowledge for a purpose and learning from the process and from the outcome. Brown and Duguid (1991) describe organizational learning as "the bridge between working and innovating." This once again links learning to action, but it also implies useful improvement.

The implications to knowledge management are three-fold:

- One must understand how to create the ideal organizational learning environment
- One must be aware of how and why something has been learned.
- One must try to ensure that the learning that takes place is useful to the organization

Organizational Learning Pitfalls

Senge (1990) argues that often it is failure that provides the richest learning experience, which is something that organizations need to understand and use more effectively. He criticizes the way we reward success and look down upon failure as something that can be detrimental to the long-term health of the organization. Levitt and March (1996) further argue that success is ambiguous and depends on how it is interpreted. This interpretation may not only vary significantly between different groups within the organization but may change over time as success indicators and levels of aspiration change.

Levitt and March (1996) also discuss superstitious learning. This occurs when positive or negative results are associated with the wrong actions. Success and failure can both generate superstitious learning. If a firm does well, the routines that they followed are linked to this success and are subsequently reinforced. The opposite is true for failure. In such cases, the organization thinks that it has learned when in fact it has not. Real organizational learning would have resulted from the examination of the information generated from their actions rather than from relatively arbitrary success or failure criteria.

Different Approaches to Organizational Learning

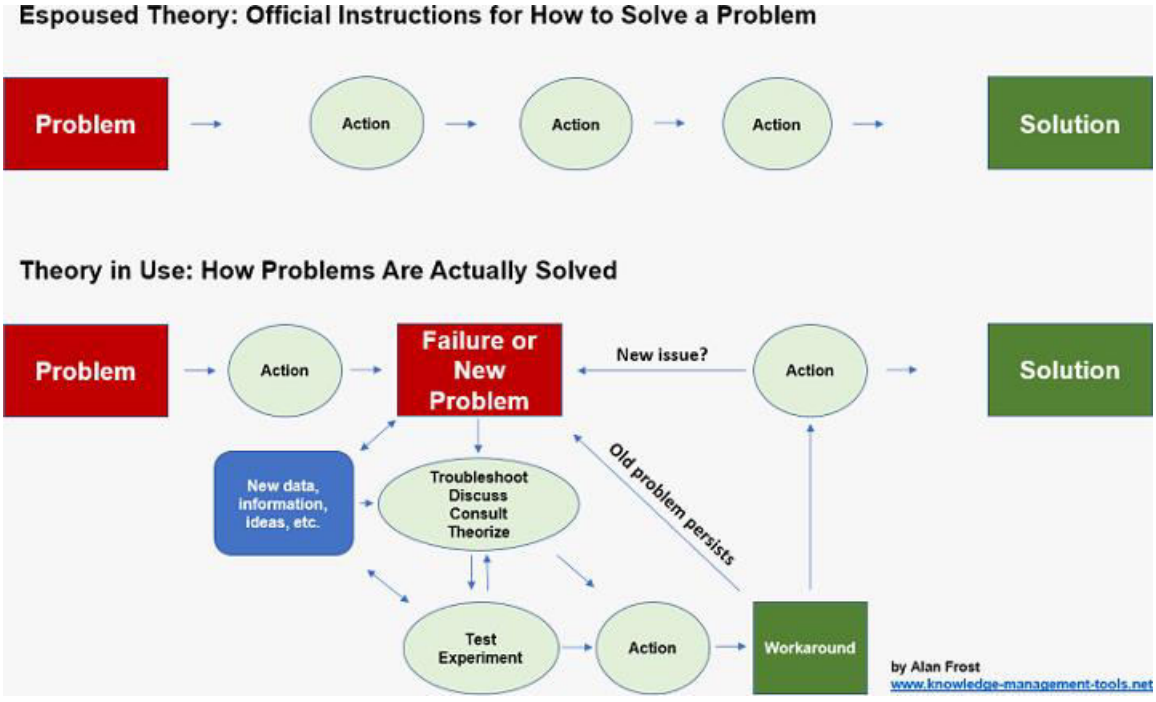
Generally speaking, there are two approaches to organizational learning. The first view looks at the firm as a whole and s learning from a cognitive perspective. In a way, the firm is treated like a large brain composed of the individual members of the organization. The second view looks at learning as community based, where the firm's practitioners create knowledge in their own networks called communities of practice (Lave & Wenger 1991).

These views should be seen as complementary rather than contradictory. The next two sub-sections will organizational learning theory from these two perspectives.

Organizational Learning Theory: Company Perspective

Two of the most noteworthy contributors to the field of organizational learning theory have been Chris Argrys and Donald Schon. Organizational learning (OL), according to Argrys & Schon is a product of organizational inquiry. This means that whenever expected outcome differs from actual outcome, an individual (or group) will engage in inquiry to understand and, if necessary, solve this inconsistency. In the process of organizational inquiry, the individual will interact with other members of the organization and learning will take place. Learning is therefore a direct product of this interaction.

Argrys and Schon emphasize that this interaction often goes well beyond defined organizational rules and procedures. Their approach to organizational learning theory is based on the understanding of two (often conflicting) modes of operation:



Espoused theory: This refers to the formalized part of the organization. Every firm will tend to have various instructions regarding the way employees should conduct themselves in order to carry out their jobs (e.g. problem solving). These instructions are often specific and narrow in focus, confining the individual to a set path. An example of espoused theory might be "if the computer does not work, try rebooting it and then contact the IT department."

Theory-in-use: This is the actual way things are done. Individuals will rarely follow espoused theory and will rely on interaction and brainstorming to solve a problem. Theory in use refers to the loose, flowing, and social way that employees solve problems and learn. An example of this might be the way someone actually solves a problem with their computer by troubleshooting solutions, researching on forums, asking co-workers for opinions, etc.

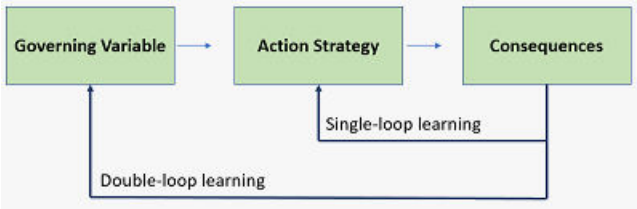
The fact that there is a mismatch between these two approaches is potentially problematic if the company enforces its espoused theory. In order to create an environment conducive to learning, firms are encouraged to accept theory in use, and make it easy for the individual to interact with his working environment in an undefined and unstructured way. Essentially, they should provide the right environment for organizational inquiry to take place, unconstrained by formal procedures.

Levitt and March (1996) expand further on the dynamics of organizational learning theory. Their view presents the organization as routine-based, history dependent, and target oriented. While lessons from history are stored in the organizational memory, the event itself is often lost. They note that past lessons are captured by routines "in a way that makes the lessons, but not the history, accessible to organizations and organizational members." The problem most organizations face is that it is usually better to have the event rather than the interpretation. However, this is often too costly (both financially and time-wise) to be feasible.

OL is transmitted through socialization, education, imitation and so on, and can change over time as a result of interpretations of history.

Organizational Learning Theory: The Three Types of Learning

Argrys and Schon (1996) identify three levels of learning which may be present in the organization:



- **Single loop learning:** Consists of one feedback loop when strategy is modified in response to an unexpected result (error correction). E.g. when sales are down, marketing managers inquire into the cause, and tweak the strategy to try to bring sales back on track.
- **Double loop learning:** Learning that results in a change in theory-in-use. The values, strategies, and assumptions that govern action are changed to create a more efficient environment. In the above example, managers might rethink the entire marketing or sales process so that there will be no (or fewer) such fluctuations in the future.
- **Deuterolearning:** Learning about improving the learning system itself. This is composed of structural and behavioral components which determine how learning takes place. Essentially deuterolearning is therefore "learning how to learn."

This can be closely linked to Senge's concept of the learning organization, particularly in regard to improving learning processes and understanding/modifying mental models.

Effective learning must therefore include all three, continuously improving the organization at all levels. However, while any organization will employ single loop learning, double loop and particularly deuterolearning are a far greater challenge.

Conclusion

From organizational learning theory we can infer the following issues which may affect knowledge management and knowledge management systems:

- OL is dependent on allowing organizational inquiry to take place according to theory-in-use, not espoused theory.
- OL is a complex mechanism, resulting often in the storage of interpretations of past events, rather than the events themselves.
- OL can take place on three different levels. While single loop learning comes natural to any individual/organization, special attention must be paid to the double-loop and deuterolearning

Organizational Learning and Communities of Practice

What are Communities of Practice?

Communities of practice is a term originally developed by Lave and Wenger (1991). It describes a learning theory with a strong relationship to the social construction of knowledge. The community of practice (sometimes incorrectly referred to as "communities of practices") consists of members who interact with each other for their pursuit of a common practice. It is therefore this collective social practice that links individuals together across official organizational boundaries and departments and makes up the community.

It is important to note that these are not teams. A community of practice can be defined as "a group of professionals informally bound to one another through exposure to a common class of problems, common pursuit of solutions, and thereby themselves embodying a store of knowledge" (Stewart 2001 in Botha et al 2008).

For further reading and a very detailed overview on the workings and composition of communities of practice, see this article by Etienne Wenger (one of the founders of the term).

Learning Within Communities of Practice

Learning is seen as deriving from the social process of becoming a practitioner, as it gives the individual a social context of being an integrated part of a community. The social construction of identity shapes each person's view and interpretation of the world. Learning and the creation of new knowledge can then take place within the context dependent forum of the community and can be shared through social practice.

Lave and Wenger (1991) introduce the concept of legitimate peripheral learning (LPP). LPP links learning to participation within a community of practice. The objective is not to acquire any specific knowledge, but instead to be granted access to the community and its culture and language. As a newcomer learns the

formal and informal culture and values of the community, he becomes a legitimate member. Essentially, he moves form peripheral to full participation.

Brown and Duguid (1991) further investigate organizational learning from a community perspective. They refer to canonical and non-canonical practice- which are concepts similar to espoused theory and theory-in-use described in the previous section. Canonical practice refers to adherence to formal rules and procedures, while non-canonical refers to the informal routines that dominate day to day procedures. Brown and Duguid warn against strict canonical focus as it inhibits the problem-solving capabilities of the organization. They stress that it is unstructured dialogue, particularly through storytelling, that leads to innovation and problem solving.

Storytelling functions as a wisdom repository and is instrumental in the creation of new knowledge. This is closely linked to Levitt and March's concept of history dependent learning where the interpretations of events (rather than the actual events) are remembered and passed on. It is also somewhat reminiscent of Nonaka's externalization process, when tacit knowledge is made explicit often through the use of metaphor.

Garfield (2018) presents a number of principles concerning communities in organizations, including:

- They must be independent of organizational structure.
- They are not teams, sites, blogs, etc.; they are people who interact, and they are based on topics.
- Community membership cannot be forced; it must be voluntary.
- Communities should span organizational, functional and geographic boundaries.
- Communities require a "critical mass" of members.
- Communities must be nurtured.

The Implications to KM

Botha et al (2008) summarize the key factors regarding communities of practice as follows:

- Learning is a social phenomenon

- Knowledge is integrated into the culture, values, and language of the community
- Learning and community membership are inseparable
- We learn by doing and therefore knowledge and practice are inseparable.
- Empowerment is key to learning: The best learning environments are created when there are real consequences to the individual and his community of practice.

Management must understand the advantages, disadvantages, and limitations of communities of practice. For example, because they are so loosely defined it may be very hard to identify them when a problem needs to be solved- to resolve this some companies today are mapping their communities of practice (Botha 2008). Another issue could be the problem of transferring and combining knowledge across the firm. Due to the close ties to "doing" as well as the cultural elements, this may require innovative solutions- e.g. using temporary cross functional project teams that can leverage knowledge from different areas, apply it, learn, and the redistribute the new knowledge back into the individual members' communities.

All this should underline the importance of recognizing and supporting communities of practice. Knowledge management (KM) initiatives and systems must therefore be supportive, non-disruptive, and must not enforce canonical practice.

Organizational Culture and Leadership

The Significance of Organizational Culture

In this article I will look at organizational culture and its impact on KM processes. The other article in this section s leadership and the learning organization, as outlined by Peter Senge.

What is Organizational Culture?

The social elements of knowledge that have been underlined in previous sections are at least partially dependent on organizational and community culture. Organizational culture determines values and beliefs which are an integral part of what one chooses to see and absorb (Davenport & Prusak 2000). It includes a shared perception of reality, regarding how things are and how things should be. Furthermore, community and group culture determine the willingness and conditions for knowledge sharing with other members of the organization. Knowledge, and knowledge sharing, are thus inseparable from organizational culture.

Wellman (2009) essentially describes culture as "the way it is around here." To illustrate the perseverance of organizational culture he presents an interesting allegory which I will summarize below:

"Put five apes in a cage. Then dangle a banana from the ceiling of that cage and place a ladder under it. Whenever an ape attempts to climb the ladder to reach the banana, spray all of them with cold water. After a few times, the apes will associate climbing the ladder with being sprayed with cold water. One can now turn off the cold water.

Then, replace one of the original apes with a new one. This new ape will undoubtedly try to get to the banana, but if he tries he will be attacked by the others. He will have no idea why this is so but will soon learn that he must not climb the ladder. Next replace yet another ape. When he approaches the ladder all the apes will attack him. One of these apes has no idea why he may not climb the

ladder, but he participates in the punishment enthusiastically. Soon the new ape will also learn not to climb the ladder.

In this way, one can continue until all the original apes are replaced. At this stage, none of them know why they must not climb the ladder, but none will do so, and all will attack anyone that tries. All of this because "that's the way it has always been around here."

Strange as it may seem, this kind of cultural learning can be identified time and again in real world organizations. Wellman points out that at times this can be beneficial and detrimental. Hard wiring a reaction can push the organization into action quickly against a perceived threat. The problem is that this "instinctive response may be inappropriate for the current environment but may be triggered nonetheless" (Wellman 2009).

All in all, organizational culture can be split into levels (Schein 1992):

- **Artifacts:** These represent the visible elements such as processes, structures, goals, climate, dress codes, furniture, etc. An outsider can see them but may not understand why things are the way things are.
- **Espoused values:** The values espoused by the leaders. They most often are grounded in shared assumptions (see below) of how the company should be run. If there is a significant mismatch between the leadership espoused values and this perception, the organization may be in trouble.
- **Assumptions:** These are the actual values of the culture. They refer to the (often tacit) views of the world itself (e.g. human nature). Again, these assumptions should need to correlate at least to a certain degree to the espoused leadership values for the organization to function smoothly.

Organizational Culture and Knowledge Sharing

The importance of a knowledge sharing culture as an enabler for the transfer and creation of knowledge is directly addressed by such authors as Bukowitz & Williams (1999), Davenport and Prusak (2000), and Gamble and Blackwell (2001). In order to make knowledge management initiatives work in practice, the employees within the firm must be willing to share their knowledge with others.

Leaders must understand the culture both on an organizational and community level. While culture often exists on an organizational level, each community may have its own norms, perspectives, and collective understandings. Their willingness to share and to seek knowledge will be influenced by these collective views.

One major influence on a culture's knowledge sharing willingness is the issue of reciprocity (Davenport & Prusak 2000). This refers to the individual's need to perceive a current or future return on the knowledge he chooses to share. This could be in the form of direct compensation of some kind; it could be something intangible like enhancing the individual's reputation; but it can also be the knowledge that the favor will be returned the next time he requires assistance.

Finally, internal competition is yet another aspect of organizational culture that may interfere with the knowledge sharing and knowledge creation process.

The Problems with Managing Organizational Culture

The problems with managing culture can be summed up as follows:

- Culture reaffirms itself by rejecting misfits and promoting those that adhere to the norms of the organization (Gamble & Blackwell 2001).
- Culture often consists of learned responses that are hard wired into the organization. The actual events that sparked this "lesson" may be long forgotten (Wellman 2009). This is very similar to the concept of organizational learning according to Levitt and March (1996) which indicates that organizations are far more likely to remember interpretations of events rather than the event itself.
- Culture contains falsehoods. Past lessons are applied often without understanding them and their reasons for being.

All this makes organization culture extremely difficult to change and manage. For more on this, see the section titled corporate culture change.

Leadership and "The Learning Organization"

The term "learning organization", not to be confused with organizational learning, was popularized by Peter Senge. It describes an organization with an ideal learning environment, perfectly in tune with the organization's goals. Such an organization is a place "where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to see the whole (reality) together." (Senge 1992).

This subsection will focus largely on the work of Peter Senge, and it will serve as a basis for understanding:

1. The ideal organizational environment for learning, knowledge management (KM), innovation, etc., as described through the term "the learning organization".
2. The leadership qualities necessary for promoting and encouraging this ideal environment.

The Learning Organization

According to Senge, the learning organization depends upon the mastery of five dimensions:

Systems thinking: The notion of treating the organization as a complex system composed of smaller (often complex) systems. This requires an understanding of the whole, as well as the components, not unlike the way a doctor should understand the human body. Some of the key elements here are recognizing the complexity of the organization and having a long-term focus. Senge advocates the use of system maps that show how systems connect.

Personal mastery: Senge describes this as a process where an individual strives to enhance his vision and focus his energy, and to be in a constant state of learning.

Mental models: "Deeply ingrained assumptions, generalizations, or even pictures and images that influence how we understand the world and how we take action" (Senge 1990). These must be recognized and challenged so as to allow for new ideas and changes.

Building shared vision: Shared vision is a powerful motivator. A leader's vision does not necessarily become shared by those below him. The key here is to pass on a picture of the future. To influence using dialogue, commitment, and enthusiasm, rather than to try to dictate. Storytelling is one possible tool that can be used here.

Team learning: The state where team members think together to achieve common goals. It builds on shared vision, adding the element of collaboration.

The Role of Leadership

Senge emphasized the role of the leader in the creation of this learning organization. He defined three leadership roles (1990) that would reshape the old-fashioned approach to be the boss. These are:

Leader as Designer: Senge likens this to be the designer of a ship rather than its captain. He defined it in three ways:

- Creating a common vision with shared values and purpose.
- Determining the "policies, strategies, and structures that translate guiding ideas into business decisions."
- Creating effective learning processes which will allow for continuous improvement of the policies, strategies, and structures.

Leader as Teacher: The leader here is seen as a coach that works with the mental models present in the organization. He must understand the (usually tacit) concepts of reality and restructure these views "to see beyond the superficial conditions and events [and] into the underlying causes of the problems."

Leader as Steward: This is the vaguest of the three and refers largely to the attitude of the leader. He emphasizes the importance of a leader that feels he is part of something greater; whose desire is first and foremost not to lead, but to serve this greater purpose of building better organizations and reshaping the way businesses operate.

The first two roles outlined by Senge shed a lot of light into the requirements of effective KM and organizational learning.

Knowledge Management Models

Building Knowledge Management Frameworks and Models

At this stage we have had a look at the components and definitions that related to knowledge management (KM). This section deals with knowledge management frameworks and models. The old saying that a picture paints a thousand words is very much applicable in this case. A good model can integrate various elements and show relationships in a way that is much harder to do in writing.

But first, what are the components of a knowledge management framework? At the most basic level, KM consists of the following steps:

- Identification of needs
- Identification of knowledge resources
- Acquisition, creation, or elimination of knowledge related resources/processes/environments
- Retrieval, application and sharing of knowledge
- Storage of knowledge

It is important to note that none of these processes are independent and all of them are affected by countless factors. This is why knowledge management frameworks are typically very different and can be presented in a wide variety of ways.

For instance, some models are sequential (as above), and seek to provide a better overview at the expense of "realism". Other models display overlapping processes in an attempt to simulate what actually occurs inside an organization. The problem with the latter is that they are often hard to grasp and can only convey limited information so as not to become incomprehensible. In the following section I will provide examples of both.

Since KM is closely related or dependent on other disciplines (such as strategy, information management, project management, etc.) and it is enabled by a wide range of processes and systems, a model can become very complex indeed.

This is why there is no such thing as an integrated and fully detailed knowledge management framework, i.e. one that captures all relevant aspects with appropriate detail. Each model must choose its focus and origin, as well as its limitations.

There are essentially three questions that a knowledge management framework may choose to answer:

- What/How
- Why
- When

"What/how" refers to the actual processes of knowledge management.

"Why" refers to an indication of the reasons behind using one method or the other.

"When" refers to the timing for using one method or another and is very closely related to "why".

The latter two questions are usually tackled in more strategic oriented models that take a broader perspective. What/how is usually dealt with in process-oriented models that focus on an understanding of the tools available to the manager. These kinds of models are generally more common particularly since the role of knowledge management can be defined far more narrowly than I have chosen to do on this site.

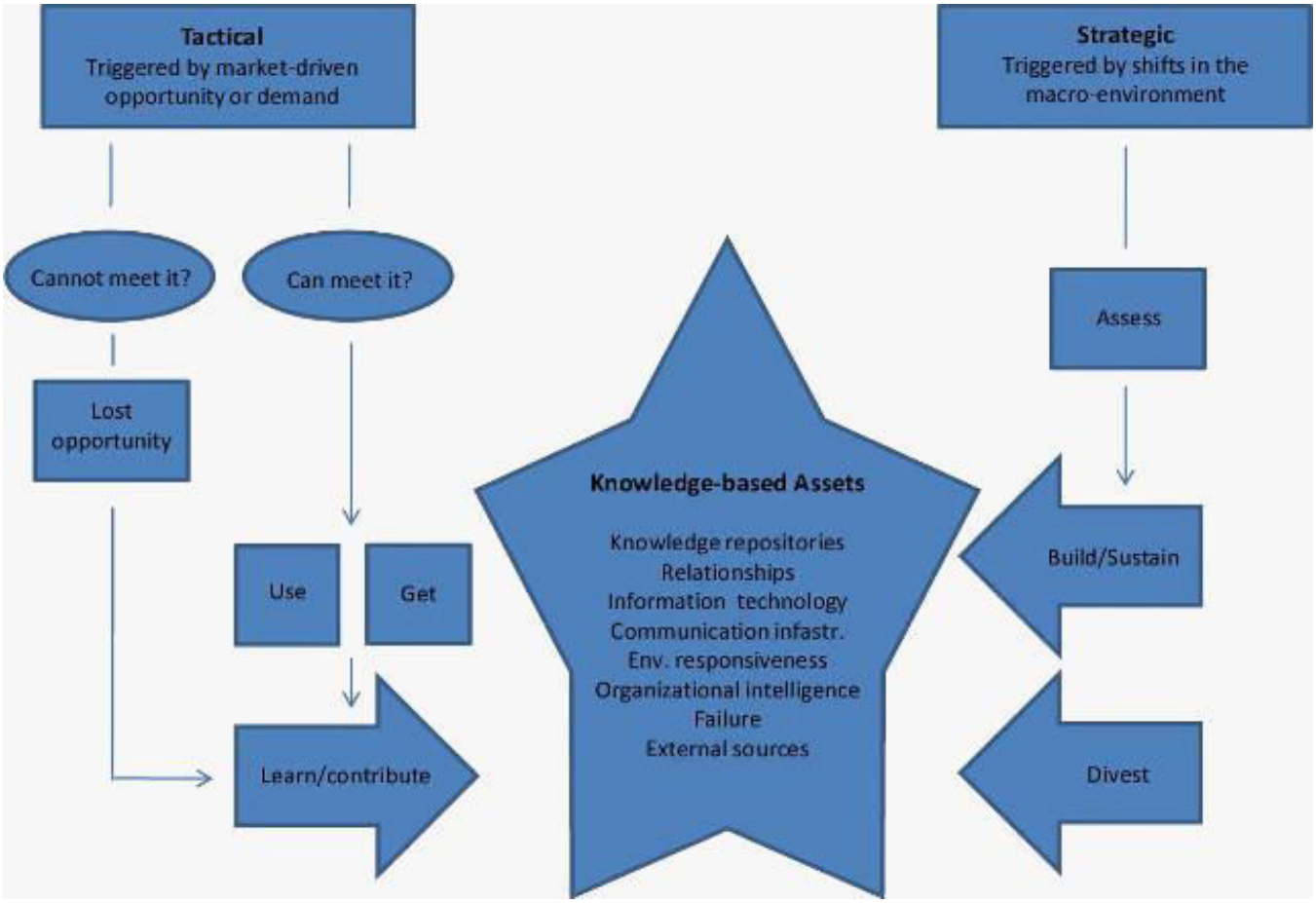
In the following section I will a few solid KM models dealing with all the aspects I have discussed above. However, before I conclude, I will present a very useful framework outlined by Botha et al (2008) titled the "knowledge management broad categories".

You don´t know	Knowledge Discovery	Explore, research, create
You know	Knowledge Repository (Knowledge Base)	Knowledge sharing and transfer
	Knowledge you have	Knowledge you don’t have

Here, one can see the role of knowledge management from a broad perspective (very similar to the one adopted on this site), i.e. which includes more than just knowledge sharing/access/etc, but also new knowledge creation. These categories provide a solid overview of the components of any knowledge management framework focusing on the what/how question.

Three Knowledge Management Models

In this section I will explain three knowledge management (KM) models that take three very different approaches to KM.

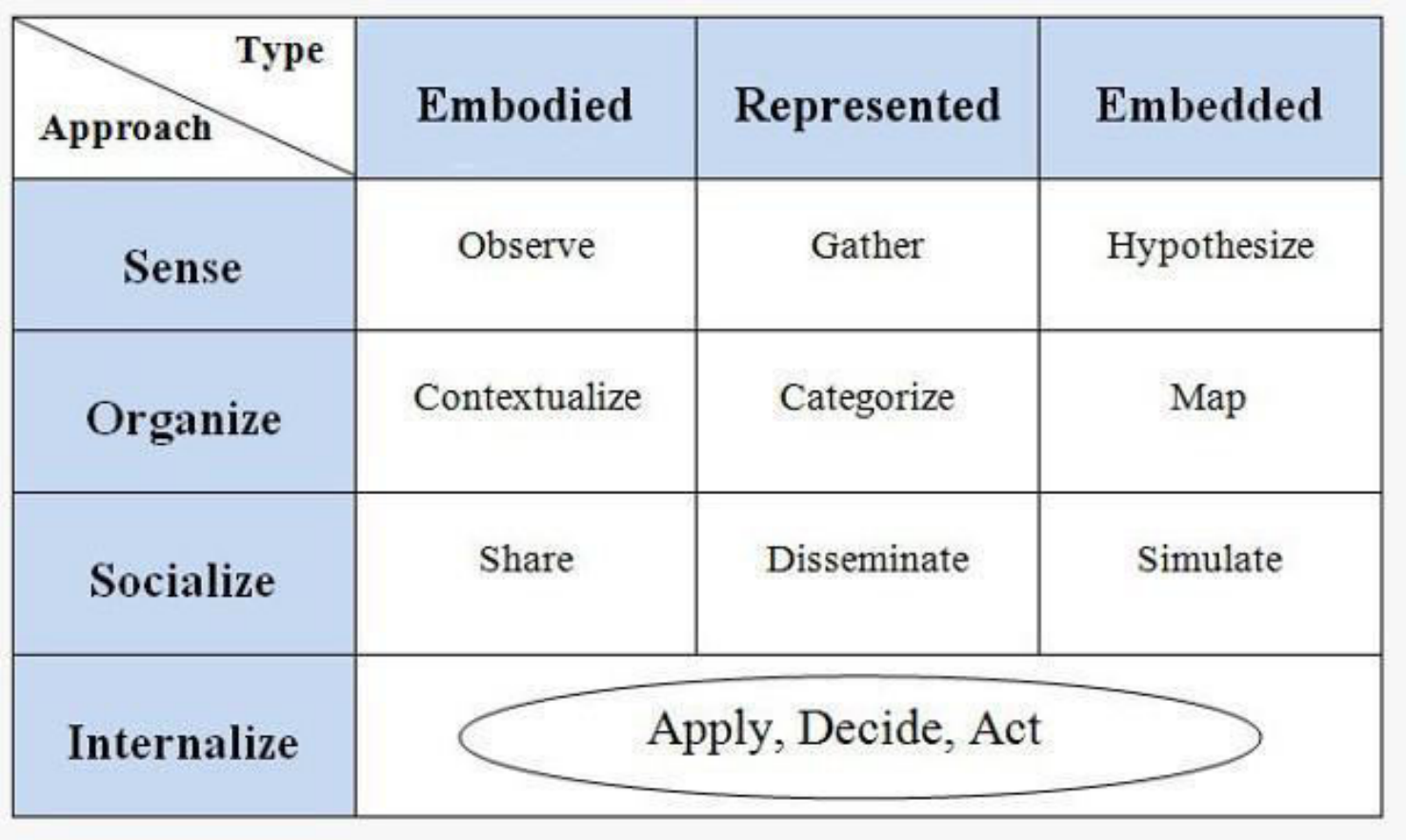


The KM Process Framework by Bukowitz and Williams (1999)

This KM model depicts the process that defines the strategy for management to build, divest, and enhance knowledge assets. It is a model that emphasizes the "why" and "when" aspects. The strengths of this model rest on its strategic focus, which essentially puts knowledge management action into context. It is also worth

noting that the notion of "divestment" is included - something which is often missing from KM models.

KM initiatives are the result of the response to tactical and strategic changes and needs. The model provides a great overview of the strategy behind KM but it does not include any deeper insight into what initiatives are suitable in a given instance.



Type / Approach	Embodied	Represented	Embedded
Sense	Observe	Gather	Hypothesize
Organize	Contextualize	Categorize	Map
Socialize	Share	Disseminate	Simulate
Internalize	Apply, Decide, Act		

The KM Matrix by Gamble and Blackwell (2001)

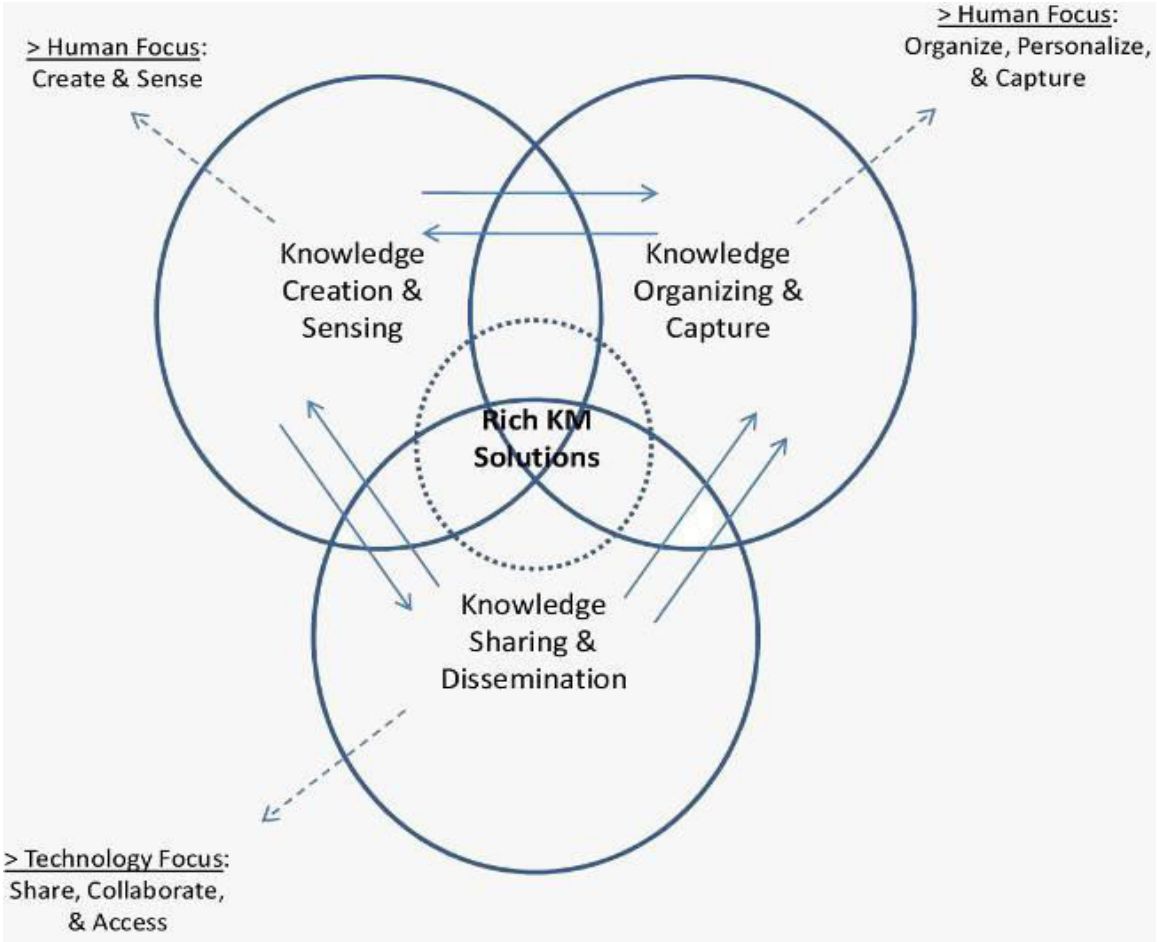
This KM model presents a general theoretical framework, as well as specific guidelines for implementation.

The KM process is split into four stages. First management must locate the sources of knowledge. Then they must organize this knowledge so as to assess the firm's strengths and weaknesses and determine its relevance and reusability. This is followed by socialization, where various techniques are used to help share and

disseminate it to whomever needs it in the organization. Finally, the knowledge is internalized through use.

As all sequential models, the steps are not to be taken literally, but they do provide an excellent overview of the role of the KM manager. However, one limitation of this model is its focus. First of all, the overall strategic role outline by Bukowitz and Williams is not included. Secondly, KM's role here is limited to knowledge sharing, omitting the processes of knowledge acquisition/creation and divestment. This is a perfectly legitimate approach to KM where the focus is on the sharing and retrieval of existing knowledge, but it does not fulfill the scope of the knowledge management definition outlined on this site.

The Knowledge Management Process Model by Botha et al (2008)



This model attempts to offer a more realistic overview of the KM process. The three broad categories overlap and interact with one another. Like Gamble & Blackwell, the focus is on managerial initiatives. Here too the strategic focus (the "when" and the "why" as opposed to the "what") is omitted. It is noteworthy that this model does include the creation of new knowledge as a specific KM initiative.

The model further shows which of the three categories are more people oriented and which are more technology focused. Whether or not knowledge sharing should be largely technology focused is certainly debatable and it is something that I will address in future sections. However, for better or for worse, this is largely how organizations tend to approach the issue i.e. as a technological rather than organizational and social challenge.

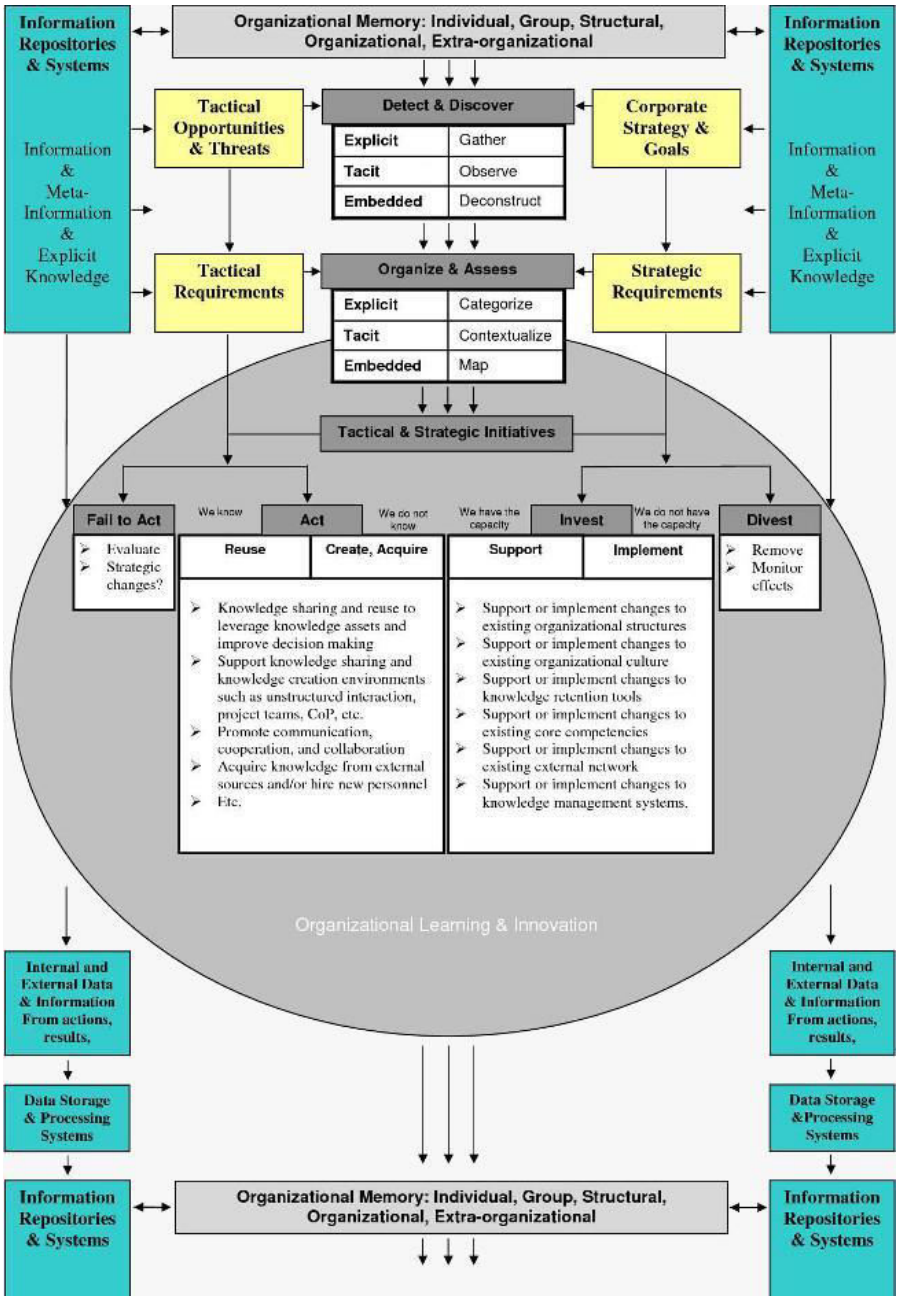
We have now looked at three models that take very different approaches to KM. There is one other important aspect relating to KM that has not been directly dealt

with by these models. I am referring now to the measurement of effects that lets management know whether the implemented initiatives are achieving the desired results. This is dependent upon data and information management but is paramount for future KM initiatives.

Based on these models, as well as on the topics discussed on this site so far, I will present my version of an integrated knowledge management model.

My Integrated Model

The integrated knowledge management model that I have created combines the main aspects of the topics discussed on this site into a model that focuses on the strategic perspective. The integrated knowledge management model attempts to link both process and strategy, while offering specific initiatives at different stages. The model also outlines the relationship of information and information management systems to knowledge management (KM).



The integrated knowledge management model draws upon elements presented by Bukowitz & Williams, Gamble & Blackwell, Botha et al, and Nonaka & Takeuchi. It also includes the concept of organizational memory as defined earlier.

The dark gray elements represent KM initiatives, the yellow boxes represent corporate strategy, while the teal boxes depict data and information systems and repositories. The process is initiated from the tactical and strategic considerations, illustrating the way KM strategy goes hand in hand with corporate strategy. The non-bolded elements in the gray oval indicate the knowledge related processes that go on within the organization as it operates, and which management affects/enhances through its initiatives.

- Detect & Discover: Search for existing knowledge as well as hidden knowledge within information and data.
- Organize & Assess: Organization and assessment of knowledge assets. Knowledge is categorized, evaluated, and made easier to access (by providing maps etc.).
- KM Tactical initiatives:
  - Act - Reuse: If the firm can use existing knowledge to meet a tactical opportunity or threat, the role of KM is to identify this knowledge and enable it to be used. This means that if it is required by a different person/group, then KM is responsible for making it available to all relevant parties.
  - Knowledge reuse thus combines the previous points on detection and organization with a new aspect: knowledge sharing.
  - Act - Create/acquire: If the right knowledge resources do not exist, the firm may create or acquire them, assuming the right processes and systems are in place to support this. For example, the knowledge may be acquired from partners if the right relationships are in place. knowledge creation depends on the right internal environments that allow for combination and conversion of knowledge assets.
  - Failure to act: This is not really a KM initiative in itself, but it does have some implications. In the event that a firm fails to act there is still a lesson to be learned. Management must evaluate if this is something

that needs to be addressed in the future. This decision is fed back into the loop, affecting future strategic choices.

- KM Strategic Initiatives:
  - **Invest:** Support or implement. Here I refer to the organizational structures, culture, knowledge retention, competencies, external network, and systems that direct, affect, and/or enable the KM initiatives discussed above in the long term. Strategic initiatives may, for example, involve creating a knowledge sharing culture, restructuring the firm, establishing a beneficial partnership, or implementing a new IT system. If the right environment, system, etc. is already in place, management must make sure to continuously support it. It is important to note that some of these do not fall solely within KM, and they are all fields of study in their own right. However, in this case, we are interested solely in the way these broader strategic initiatives shape the focus and direction of KM in the long term.
  - **Divest:** When knowledge assets become obsolete they need to be removed. KM is responsible for maintaining relevant knowledge assets.

The differentiation between tactical and strategic initiatives should not be seen as categorical, and in reality, projects and initiatives will often have mixed goals. The integrated knowledge management model itself should be seen as continuously looping, with new or modified knowledge and information being fed into organizational memory and information repositories each time.

All processes are thus supported by information systems. They play an important role in tracking progress and feeding that information back into the system. This way, each time the integrated knowledge management model is run, it is based on different information, understanding, knowledge, and circumstances than the last time. As with all sequential models, none of this should be taken absolutely literally.

Although this is called an "integrated" knowledge management model, it is not intended to be all-encompassing. Since KM is such a broad discipline, one could continue to add elements until the model was so complex that it had no meaning.

Conclusion

In this section and the preceding ones, I have looked at various KM models and presented my version of an integrated knowledge management model.

Although not intended to represent all possible areas, the integrated knowledge management model does cover the major requirements of a model as defined earlier. To recap, these are:

- Identification of needs
- Identification of knowledge resources
- Acquisition, creation, or elimination of knowledge related resources/processes/environments
- Retrieval, application and sharing of knowledge
- Storage of knowledge

It also addresses (at least to some degree) the 3 main approaches to knowledge management, also outlined in earlier sections, namely: what/how, why, when. Finally, the model ties in information, strategy, and organizational memory, building on the work of past authors.

The following section will knowledge management processes and knowledge management strategy in-depth. The section will be modelled after the categories presented in this integrated knowledge management model.

Knowledge Management Processes

Introduction Knowledge Management Processes

This section will deal with the actual knowledge management processes. So far, I have presented an introduction to knowledge management as well as several frameworks. Now it is time to talk about the different processes and initiatives.

This section, as well as the subsequent one on knowledge management strategy, will be structured according to the layout of the integrated knowledge management model presented earlier.

Under the initiative referred to as "act", the integrated model outlines a series of knowledge management processes. They will be used as headings for the subsections presented here and can be accessed through the menu on the left. These are:

- Knowledge Discovery & Detection
- Knowledge Organization & Assessment
- Knowledge Sharing
- Knowledge Reuse
- Knowledge Creation
- Knowledge Acquisition

These form the backbone of knowledge management processes as they outline all aspects involved in the actual management of knowledge.

At the end of the section on knowledge management strategy, a subsection titled knowledge management best practices will summarize all the aspects discussed thus far.

Knowledge Discovery and Detection

In this subsection, I will the knowledge management (KM) initiatives involved in knowledge discovery & detection.

This step deals with discovering the knowledge that a firm possesses all over the organization, as well as the patterns in the information available that hide previously undetected pockets of knowledge.

Once knowledge is created, it exists within the organization. However, before it can be reused or shared it must be properly recognized and categorized. This subsection deals with the former aspect, while the following subsection deals with the latter.

- Explicit Knowledge: This is largely a process of sorting through documents and other records, as well as discovering knowledge within existing data and knowledge repositories. For the latter, IT can be used to uncover hidden knowledge by looking at patterns and relationships within data and text. The main tools/practices in this case include intelligence gathering, data mining (finding patterns in large bodies of data and information), and text mining (text analysis to search for knowledge, insights, etc.). Intelligence gathering is closely linked to expert systems (Bali et al 2009) where the system tries to capture the knowledge of an expert, though the extent to which they are competent for this task is questionable (Botha et al 2008).
- Tacit knowledge: Discovering and detecting tacit knowledge is a lot more complex and often it is up to the management in each firm to gain an understanding of what their company's experts actually know. Since tacit knowledge is considered as the most valuable in relation to sustained competitive advantage, this is a crucial step, a step that often simply involves observation and awareness. There are several qualitative and quantitative tools/practices that can help in the process; these include knowledge surveys, questionnaires, individual interviews, group interviews, focus groups, network analysis, and observation. IT can be used

to help identify experts and communities. Groupware systems and other social/professional networks as well as expert finders can point to people who are considered experts and may also give an indication of the knowledge these people/groups possess.

- Embedded knowledge: This implies an examination and identification of the knowledge trapped inside organizational routines, processes, products etc., which has not already been made explicit. Management must essentially ask "why do we do something a certain way?" This type of knowledge discovery involves observation and analysis, and the use of reverse engineering and modeling tools.

It is important to note that the sources of knowledge that a firm has access to may extend well outside the organization. This type of knowledge, which was introduced in the previous subsection on "Understanding Organizational Knowledge" is called extra-organizational knowledge. This can exist in both formal and informal settings. The former refers to management driven initiatives like partnerships, while the latter refers to the informal networks of individual members. We are interested in the former, which can be located and managed at least to some degree. Gamble and Blackwell identify several such sources:

- Alliances
- Suppliers
- Customers

At this stage, we are still only discussing knowledge discovery and detection, so these relationships will not be explored in detail (see knowledge acquisition and external knowledge networks for more). Knowledge from alliances and partners can exist in joint projects, shared knowledge/experts' operational data and so on. Suppliers and customers can provide product feedback, trends, developments etc. Within their respective limitations, similar tools as above can be used to identify the knowledge and/or knowledge sources.

IT can be used in this context both as a means of feedback, communication, and cooperation between partners, and also as a way to gather, analyze, and "mine" data and information.

Facilitating Knowledge Discovery and Detection

Useful to this process is the adoption of practices that make knowledge easier to detect. For example, teams could be asked to document aspects of their work with a certain language and presentation standard. Generalists could be used to help organize this process, as well as to document the expertise of the individual team members (which can be used later to promote tacit knowledge socialization). A rundown of how management should prepare knowledge in specific situations is presented in the final segment of the Knowledge Reuse subsection.

Knowledge Organization & Assessment

The idea that firms should categorize their knowledge assets is not a new one (Horvath 2000, Bukowitz & Williams 1999). In order to determine what resources, they have at their disposal and to pin point strengths and weaknesses, management needs to organize the knowledge into something manageable. Knowledge organization involves activities that "classify, map, index, and categorize knowledge for navigation, storage, and retrieval" (Botha et al. 2008). Markus (2001) assigns the role of preparing, sanitizing, and organizing this knowledge to a "knowledge intermediary". This may be a knowledge manager, or it may also be the actual producer of the knowledge. The point is, that in order for knowledge to be shared (either for reuse in a business situation or as a tool for knowledge creation), it must be prepared in such a way that it can be identified, retrieved, and understood by the knowledge user.

Explicit knowledge organization: IT is generally encouraged as a means of organizing and retrieving (Gamble and Blackwell 2001, Botha et al 2008, etc.). IT based systems use taxonomies and ontologies to classify and organize knowledge and information (Bali et al 2009). These are categorization methods that create a logical, hierarchical knowledge map, allowing the user to navigate by category. However, taxonomies are very expensive to create (Botha et al 2008). It is relevant to note here that although explicit knowledge is not considered as valuable as tacit knowledge, due to its sheer volume, an effective method of classification and retrieval is often essential. Other tools include libraries and data marts (Gamble & Blackwell 2001).

Tacit knowledge organization: Use of focus groups, expertise guides, social network analysis, and knowledge coordinators (Gamble and Blackwell 2001 and Liebowitz 2009). The role of the latter is to understand in which context the tacit knowledge was created. Expertise locators, such as corporate yellow pages, social network analysis and other knowledge maps can be used to pinpoint the location and categorize the valuable expertise of tacit knowledge sources (a.k.a. experts).

They can also shed light into how widespread certain tacit knowledge is, enabling the firm to plan ahead for the retirement of key employees.

Embedded knowledge organization: Job/workplace design, workflow analyses and performance measures (Gamble & Blackwell 2001) can be used to organize and assess embedded knowledge. Mapping is also useful here, and knowledge maps outlining embedded knowledge can be formulated under the guidance of knowledge brokers (Horvath 2000).

Liebowitz emphasizes the determination of how important certain knowledge is to the organization. The two key factors to are knowledge severity or criticality and knowledge availability. The more critical the knowledge and the more unavailable it is (e.g. if only one or a few experts exist and/or if they are near retirement age), the more attention this knowledge deserves.

Knowledge organization and assessment can seem like an expensive endeavor, particularly since the return on investment is indirect. In other words, there is little visible gain from meticulously classifying and organizing knowledge assets. However, it is an important step in the knowledge management and reuse process. As discussed in the subsection on knowledge detection, the organization can put systems in place that facilitate the detection and organization of knowledge. These depend on the situation within which the knowledge was created, and the possible recipients. A closer look at this specific aspect is presented in the recommendations segment of the knowledge reuse subsection.

Act: Knowledge Sharing

As stated earlier, knowledge management is fundamentally about making the right knowledge or the right knowledge sources (including people) available to the right people at the right time. Knowledge sharing is therefore perhaps the single most important aspect in this process, since the vast majority of KM initiatives depend upon it. Knowledge sharing can be described as either push or pull. The latter is when the knowledge worker actively seeks out knowledge sources (e.g. library search, seeking out an expert, collaborating with a coworker etc.), while knowledge push is when knowledge is "pushed onto" the user (e.g. newsletters, unsolicited publications, etc.).

Knowledge sharing depends on the habit and willingness of the knowledge worker to seek out and/or be receptive to these knowledge sources. The right culture, incentives, and so on must therefore be present.

In the rest of this section I will discuss the concepts of knowledge sharing according to the different types of knowledge. The role of IT will also be explored and discussed from a general perspective.

Explicit Knowledge and Knowledge Sharing

Successful explicit knowledge sharing is determined by the following criteria (Bukowitz and Williams 1999):

- Articulation: The ability of the user to define what he needs.
- Awareness: Awareness of the knowledge available. The provider is encouraged to make use of directories, maps, corporate yellow pages, etc.
- Access: Access to the knowledge.
- Guidance: Knowledge managers are often considered key in the build-up of a knowledge sharing system (Davenport & Prusak 2000, Gamble & Blackwell 2001). They must help define the areas of expertise of the members of the firm, guide their contributions, assist users, and be responsible for the language used in publications and other

communication material. This is so as to avoid an information/knowledge overload.

- Completeness: Access to both centrally managed and self-published knowledge. The former is often more scrutinized but takes longer to publish and is not as hands-on (and potentially relevant). Self-published information on the other hand runs the risk of not being as reliable.

IT systems have proved extremely useful in aiding or performing many of these functions.

Explicit Knowledge Sharing and IT

IT is useful in most stages of the knowledge sharing process, and it is used for content management as well as data and text mining (looking for hidden knowledge, relationships, etc. within data and documents).

Content management systems are used to update, distribute, tag, and otherwise manage content. They may include a wide range of functions, including web content management and document management systems (which I consider separately). They may be used to (based on Wikipedia entry):

- Import and create documents and multimedia material.
- Identify key users and their roles.
- Assign roles and responsibilities to different instances of content categories or types.
- Define workflow tasks. Content managers can be alerted when changes in content are made.
- Track and manage multiple versions of content.
- Publish content to a repository to support access. Increasingly, the repository is a part of the system, incorporating search and retrieval.

Document management systems use numerous advanced indexing, searching, and retrieval mechanisms (e.g. using meta data or content from the actual document) to facilitate explicit knowledge sharing.

To take advantage of all of these functions, it is a foregone conclusion that the system was chosen and implemented appropriately. This aspect is discussed in the section on knowledge management systems.

All in all, IT is a very useful tool in the management of explicit knowledge and information. This is not to say that humans no longer play a part. They certainly do, and knowledge and content managers are instrumental in ensuring that the knowledge is relevant, up to date, and presented correctly.

Can Explicit Knowledge Sharing Systems Yield Competitive Advantage?

For the actual storage and retrieval, there is very little disagreement on the value of IT as a means of sharing, sorting, and accessing explicit knowledge. Where one does find disagreement is on the value placed on this function. KM and organizational learning theorists have sometimes downplayed the value of explicit knowledge and focused largely on tacit knowledge (Brown & Duguid, Cook & Brown 1999). However, it has also been argued that in a world where we have an overflow of explicit knowledge and information, the ability to manage it, and thus to provide continuous streams of relevant knowledge and information, can be a source of competitive advantage in itself (Maier 2002, Botha et al 2008). The latter view appears to be gaining support, although one important point should be considered: explicit knowledge management systems are quite transparent and therefore fairly easy to replicate. This means that they cannot be the source of sustained long term competitive advantage (Jackson et al 2003).

All this being said, in most cases, implementing a solid system that enables explicit knowledge sharing is crucial for the following reasons:

- Not doing so would almost certainly become a source of competitive disadvantage (for lack of a better word).
- They may well provide a short-term advantage, which may be extended through continuous improvements and new technologies.
- With proper care, such systems will also play a limited role in the sharing of tacit knowledge, as will be discussed in the next section.

Tacit Knowledge Sharing

Sharing tacit knowledge requires socialization. This can take many different forms. Davenport & Prusak (2000) outline a few relevant factors:

- Informal networks, which involve the day to day interaction between people within work environments are considered very important
- Unlike the formalized structure of the firm, these networks span functions and hierarchies. They are therefore difficult to identify and monitor.
- Management should support these networks by providing the means for communication. Japanese firms have created talk rooms where employees can engage in unstructured, unmonitored discussions. A specific location is useful but not mandatory - this process also occurs in cafeterias etc. Management must simply provide the means for employees to foster informal networks and "trade" tacit knowledge.
- Management must also understand the value of chaos. This refers to the value of unstructured work practices that encourage experimentation and social interaction. Within a more chaotic environment, individuals are given the freedom to solve problems creatively and, in so doing, must tap into and evolve their social networks. This is closely linked to the notion of theory in use vs espoused theory. The value of less structured work environments is also well known within innovation management.

Codification of tacit knowledge is difficult and sometimes outright impossible. There will often be a resulting knowledge loss (Bukowitz and Williams 1999, Davenport & Prusak 2000). Often, it is much more reasonable to simply externalize the sources of tacit knowledge rather than the knowledge itself (Davenport & Prusak 2000). This means that often it is better for experts to externalize what they know rather than how they know it. The main role of KM then becomes making sure that experts can be found so that tacit knowledge can be passed on through practice, mentoring, and networking (socialization), and that the firm supports and encourages the networking that is necessary for these functions to occur.

To share tacit knowledge requires a culture conducive to this type of sharing. Furthermore, knowledge managers (generalists that understand the types of

knowledge that exist in the communities) must be used to locate and translate knowledge elements, thus facilitating their integration into other communities. This endeavor is very much about people and managing organizational culture change.

Tacit Knowledge Sharing and IT

It is important for tacit sharing of knowledge to be people focused. However, increasingly, IT systems are becoming useful in this area as well. They can support interaction between people that are not in the same location and some tools are designed to capture unstructured thoughts and ideas. The important factor to remember is that tacit knowledge cannot always be made explicit (and may lose some of its richness in the process). Therefore, IT systems should not attempt or pretend that they can carry out this process, but instead act as an important support to existing practices.

IT can be useful as a forum for externalization of tacit knowledge. For example, groupware systems that support brainstorming can help in the codification process (Botha et al 2008). Online discussion databases and forums can also be sources of externalized knowledge (Botha et al 2008), although the richness of this knowledge should be questioned.

While IT is crucial for information management, it is important not to confuse information with knowledge. Using IT to move tacit knowledge is difficult since knowledge represents the shared understanding and the sense making that is deeply rooted in the social practice of the community. The focus for the successful sharing of tacit knowledge must be on social interaction, problem solving, mentoring, and teaching, and IT systems must be used to support these processes intelligently.

IT's contribution to OL therefore depends on its fit to the social context of the communities. Technology must not be seen as the superior solution and should not be used to structure organizational practice (at most to supplement it). There is also the danger that IT may limit the participation of some members of the community. It may make it more difficult for individuals to become accepted

members of the community by limiting socialization channels. The challenge is to extend the reach of communication without sacrificing reciprocity in regard to knowledge sharing or socialization.

During KM's boom at the turn of the century, IT-driven KM initiatives turned out to be a major pitfall. Today you still see a divide between technologically-centric views and people-oriented approaches (Bali et al 2009). Increasingly however, IT is being recognised for its ability to provide support to sound KM initiatives, within knowledge sharing, creation, etc. In different capacities, IT should be regarded as a critical tool (though not as the initiative itself).

The role of IT for tacit knowledge sharing can thus be summarized as follows:

- **As an expert finder:** To locate the source of the tacit knowledge through systems like corporate yellow pages.
- **As providing support in the socialization of tacit knowledge:** If IT systems support varied, formal and informal forms of communication then they can help tacit knowledge sharing by supporting teams, projects, communities, etc. Functions like being able to attach notes to documents, or video conferencing can support work environments over long distances to some degree. It is important not to replace existing socialization functions with IT; instead socialization should be enhanced and extended between people who would otherwise be unable to participate.
- **As providing some support in the externalization of tacit knowledge:** Through groupware applications that support the codification process, discussion forums etc. However, not only is this aspect limited, but externalization itself is only rarely feasible.

Embedded Knowledge Sharing

As a reminder, embedded knowledge refers to knowledge locked in products, processes, routines, etc.

Embedded knowledge can be shared when the knowledge from one product or process is incorporated into another. Management must understand what knowledge is locked within those sources, and they must transfer the relevant

parts into a different system. To do this, Gamble and Blackwell advocate the use of:

- **Scenario planning:** The practice of creating a set of scenarios and hypothesizing how they might unfold by drawing upon the perspectives of experts, the firm's knowledge asserts, and so on. For more on this see here http://www.valuebasedmanagement.net/methods_scenario_planning.html
- After action reviews: "is a structured review or de-brief process for analyzing what happened, why it happened, and how it can be done better" (Wikipedia).
- Management training

Embedded knowledge could theoretically be transferred as is, simply by testing the effects of procedures or design features transferred from one area to another. However, often it will have to be made explicit, or partially explicit, at least to the responsible managers. This way they can hypothesize the effects that embedded knowledge has in a given situation and use simulation and experimentation to implement it in a new area.

Beyond the knowledge mapping functions described in the subsection on organization and assessment, IT's use is usually more indirect. It can be used as support in the design of simulations, experiments, and product design, and it can also provide modeling tools used in reverse engineering of products. However, these tools are not typically considered as being knowledge management systems and are thus beyond the scope of this website.

One direct role of IT systems is as an embedded knowledge repository where procedures, guidelines, etc. are stored and retrieved. If implemented properly, with the IT system complementing rather than disrupting existing processes and culture, then it can support practices and routines, and eventually become an embedded knowledge artifact in its own right.

Conclusion

To facilitate knowledge sharing, KM must understand the requirements of the users, as well as the complexities and potential problems with managing knowledge and knowledge sources. Very broadly speaking, management must therefore implement the right processes, frameworks, and systems that enable knowledge sharing. They must also foster a knowledge sharing culture that ensures that these investments are fully utilized.

Characteristics of Knowledge Sharing	Explicit knowledge	Tacit knowledge
Characteristics	Codified knowledge found in documents, databases, etc. Easy to share, modify, and copy.	Intuitive, knowledge rooted in context & practice. Difficult to articulate, share, modify, and copy.
Management	Organize, categorize, refine, & share.	Common practice, mentoring, apprenticeships, project teams, informal networks, chaos, etc.
Use of IT	Very useful for storage, transfer, and combination.	Moderate – with careful implementation.

For explicit knowledge, seven issues have been identified that KM must consider, these are: articulation, awareness, access, guidance, completeness. IT has been identified as a key component of this type of knowledge sharing, facilitating and lowering the cost of the storage, access, retrieval, and variety of explicit knowledge.

Tacit knowledge sharing depends on socialization and practice. KM must offer the means for this to take place by providing the right forums (primarily physical, but also virtual), supporting networks and communities, and accepting unstructured work environments. Generalists, known as knowledge managers, should be used to gain an understanding of the location of knowledge sources and to bridge the gaps between communities and networks.

In order to support the transfer of tacit knowledge, KMS must support the socialization functions, while at the same time not enforcing strict managerial practices/routines/hierarchies/etc. One of its roles is as an expert finder, and it can also help in the direct transfer of tacit knowledge through the support of rich and varied methods of communication, which preferably include informal communication channels.

Embedded knowledge sharing is a process whereby embedded knowledge is passed on from one product, routine, or process to another. Several tools have been described that can help management understand the effects of embedded knowledge and help in its transfer. These were: scenario planning, after action reviews, and management training.

Act: Managing Knowledge Reuse

In previous subsections, I have identified how knowledge is identified, organized, and shared. These issues were discussed from a broad perspective, relevant to both knowledge reuse and knowledge creation (as will be discussed later). In this subsection, I will look at the specific situations involved in knowledge reuse and discuss the different managerial challenges. At the end I summarize the findings and present recommendations.

In this subsection I will focus primarily on the explicit and tacit knowledge distinctions as defined in the subsection on the different types of knowledge.

Three Roles for Knowledge Reuse

First, a quick overview of the knowledge reuse process, and some useful definitions. Markus (2001) identifies three roles in the reuse of knowledge:

- **Knowledge producer:** The original creator of the knowledge
- **Knowledge intermediary:** The one who packages and prepares the knowledge so that it may be stored, retrieved, and shared. This may involve any number of functions such as indexing, categorization, standardizing, publishing, mapping, etc.
- **Knowledge consumer:** The person who is the recipient and user of the knowledge in question.

As Markus points out, these three functions may involve different people, or they may all be done by the same person. e.g. knowledge reuse by a person accessing the documented (explicit) research of someone in a different part of the organization requires that the producer created the documents, that either he or someone else prepared them so that they may be understood and retrieved, and that the knowledge consumer retrieved and used it. In other words, the roles were filled by two or three people and the process included explicit knowledge capture and sharing across the organization. Alternatively, in another scenario someone may want to use their own documentation later on. This process involves just one

person in all three roles and the only function performed is capturing the knowledge in a way that will allow retrieval at a later point.

I would add that for tacit knowledge, the role of intermediary could be defined as the expert himself - since he must present the knowledge (through practice and socialization) in a useable way to his student, team mates, etc. It may also fall upon the person who identified this expert and made it possible for others to reach him, e.g. if a knowledge manager creates an expert profile for publishing on the intranet; this way, the knowledge manager creates an explicit account of what the expert knows rather than promoting externalization of the knowledge itself.

To sum up, someone has to produce the knowledge, someone has to make this knowledge available, and someone has to search for and use this knowledge. This implies not just the capability, but also the willingness to share, to search, and to retrieve.

Knowledge Reuse Situations

Fruchter and Demian (2002) identify two very general types of knowledge reuse:

- **Internal:** Where the knowledge producer uses his own knowledge at some future point.
- **External:** Where the knowledge consumer uses someone else's knowledge. The authors point out that the latter has a much higher failure rate for reasons that include the loss of contextual knowledge and information, and knowledge that is not properly captured due to the costs involved. A more detailed framework is offered by Markus (2001) who identifies four knowledge reuse situations. These are defined below, drawing also upon the work of Timbrell and Jewels (2002) who found support for Markus's work through their study. The recommendation segments also draw upon some of the issues discussed under knowledge-sharing, as well as some of my own insights.
- **Shared Work Producers:** People working in teams producing knowledge for their own reuse. They are closest in knowledge-distance. They generally will have a good understanding of what they need and where to find it (including both documents and experts). Knowledge reuse will however be

harder within cross functional teams. Markus also warns that the rationale for the decision making is often forgotten. They need knowledge about how/what/why it was done, what improvements could be made.

- **Shared Work Practitioners:** People who perform similar work in different settings (e.g. same position in different locations). Knowledge is produced for someone else's use. Defining the knowledge needs is usually easy, as is locating the right experts within the network (which is used frequently). Basically, they need to know how to do something or why something works.
- **Expertise-Seeking Novices:** People who seek out knowledge they do not normally work with. They are furthest in knowledge-distance. They have great difficulty "defining the questions, locating and judging, the quality of the knowledge sources, and applying the expertise." (Timbrell & Jewels 2002).
- **Miners Secondary Knowledge:** People who try to find knowledge in work produced in different contexts, so as to apply it in other situations. The knowledge and context of the consumer may be very different to the producer. The main challenge here is defining the question. Often requires complex search algorithms which are hard to create (such as those used within text and data mining).

Problems and Recommendations for Managing knowledge reuse

In the article above, I presented several situations of knowledge re-use that have different advantages, disadvantages, and requirements. I also discussed some general issues that affect the process of reuse.

Drawing upon the work thus far, and bringing in the knowledge sharing issues discussed in the previous subsection, the managerial issues regarding knowledge reuse can be summarized as follows:

- **Cost:** The time and money necessary to organize, package, store, and retrieve the knowledge. This is particularly true in the cases when tacit knowledge is externalized into explicit knowledge such as documents. A great deal of cost is associated with capturing context (something that is often impossible) and with preparing the document for retrieval. Even with

IT, the latter includes categorization, summarizing, use of metadata, etc. Content management is also necessary to check language and presentation, and also to keep the repositories relevant and up to date. The cost associated with the re-use of tacit knowledge involves setting up the right circumstances for it to take place e.g. teams, mentoring, teaching, projects, etc., as well as the systems that support communication and expertise location.

- **Specific requirements of specific individuals and groups:** Presented in Markus's four roles above. Management must be aware of the different requirements and support each situation accordingly. Articles on knowledge reuse are still dominated by IT theories which focus largely on organizing, presenting, and retrieving explicit knowledge. Again, I draw the reader's attention to the importance of socialization and informal networks, which serve as the backbone of the sharing of rich tacit knowledge (expertise). Below I present the recommendations for each re-use category, drawing again on the work of Markus (2001), on the knowledge sharing principles outlined in the previous subsection, as well as some of my own insights.
- **Shared work producers, recommendations:** For explicit knowledge, try to maintain context; pay attention to indexing, categorization, and other search related functions; document rationale behind the knowledge. For cross-functional teams assign a generalist to bring the knowledge together and to ensure consistency. For tacit knowledge support communication and informal networks (e.g. between former team members). For cross-functional teams, use the generalist to help define non-codified tacit expertise with individual team members. Record this expertise together with the individual team roles.
- **Shared work practitioners, recommendations:** If explicit, decontextualize knowledge and provide all relevant information regarding indexing, searching, and relevance. Use knowledge push to make potential recipients aware of it. For tacit knowledge, create the right situations for socialization, e.g. teamwork, projects, informal communication, etc. Use IT as an expertise locater and communication support but understand its limitations in tacit knowledge transfer.

- **Expertise-seeking novices, recommendations:** For explicit knowledge decontextualize knowledge but support recontextualization in the context used by the novice. For both knowledge types, try to codify the contents of the knowledge source e.g. by defining the content of a document or the knowledge of an expert. Provide awareness training. For tacit knowledge do as for shared work practitioners.
- **Miners Secondary Knowledge:** Record context information such as metadata. Provide relevant training regarding knowledge, data, and information repositories, as well as analysis and search techniques. Implement IT systems that match the needs of the consumer e.g. data mining and analysis tools, text mining tools, etc.
- **Willingness:** Both to package knowledge on the part of the producer or to seek it out on the part of the consumer. This brings us back to issues like culture, which promote knowledge reuse and knowledge sharing. The cultural aspect will be dealt with in the section on organizational culture change.

Act: Knowledge Creation

The ability to create new knowledge is often at the heart of the organization's competitive advantage. Sometimes this issue is not treated as part of knowledge management since it borders and overlaps with innovation management (Wellman 2009). Since I chose a broader knowledge management definition, I very much regard it as a part of the process, and I will refer (albeit superficially) to some theories that pertain to innovation.

Knowledge creation according to the Nonaka's SECI model is about continuous transfer, combination, and conversion of the different types of knowledge, as users practice, interact, and learn. Cook and Brown (1999) distinguish between knowledge and knowing and suggest that knowledge creation is a product of the interplay between them. The shift in condition between the possession of knowledge and the act of knowing - something that comes about through practice, action, and interaction- is the driving force in the creation of new knowledge. Furthermore, in order for this interplay to be most fruitful, it is important to support unstructured work environments in areas where creativity and innovation are important.

Knowledge sharing, and knowledge creation thus go hand in hand. Knowledge is created through practice, collaboration, interaction, and education, as the different knowledge types are shared and converted. Beyond this, knowledge creation is also supported by relevant information and data which can improve decisions and serve as building blocks in the creation of new knowledge.

Managing Knowledge Creation

The role of management in the knowledge creation process is thus as follows:

To enable and encourage knowledge sharing: On the tactical side, as described in the previous subsection, management must understand where and in what forms knowledge exists. They must then provide the right forums for knowledge to be shared. For tacit knowledge this implies a particular emphasis on informal

communication, while for explicit knowledge this implies a focus on a variety of IT systems. On the strategic side (to be discussed in-depth later), management must create/design the right environments, processes, and systems that provide the means and willingness for it to take place.

To create a suitable work environment: This includes the notion of creating an interplay between knowledge and knowing. It implies offering relevant courses and education, but most importantly allowing new knowledge to be created through interaction, practice, and experimentation. Botha et al (2008) point to the importance of shared experiences in the knowledge creation process when dealing with tacit knowledge, and the need for an environment where these can be formed. March (1988) discusses how our cultural norms often stifle innovation and new knowledge creation. He advocates environments where we recognize that goals can be created through action, where intuition is accepted and valued, and where experience is nothing more than a theory. These concepts bring us back to the concept of theory in use (referring to work environments that do not follow strict, "official" rules and procedures), and the acceptance and support of environments that allow brainstorming, trial and error, and unstructured interaction.

As an example, from innovation theory, one can refer to the practice of establishing teams to solve problems, unhindered by the bureaucracy that may exist in the firm. Peters (1988) refers to the value of chaos and the advantage of smaller, fast-acting teams. One common alternative is the use of cross-functional project teams. These are usually a group of experts from different parts of the organization, led by a "generalist" project leader. If these teams are allowed the freedom to experiment and work in an autonomous, or virtually autonomous environment, it can be a great catalyst for innovation and new knowledge creation. Then, once the task is complete, the members return to their role in the organization, helping to spread this knowledge back into their own community of practice. The project team itself can also facilitate the creation of bridges between communities of practice, and at times may even serve as a way to extend them. Variations of this concept can be seen in several places in innovation theory, notably in Nonaka and Takeuchi's self-organizing project teams in the hypertext organization.

To provide systems that support the work process: These can be groupware systems that facilitate communication or brainstorming. However, they must not interfere with creative processes or communities of practice or enforce rigid organizational practices (espoused theory).

To provide knowledge workers with timely, relevant information and data. In today's fast paced environment this is virtually synonymous with the implementation of IT systems which can store, retrieve, organize, and present information and data in a helpful way.

IT and Knowledge Creation

The use of IT is very much the same as it is for knowledge sharing, allowing for some degree of support in the transfer of all knowledge types. One important aspect is that it must support, and not interfere with, informal collaboration. For example, groupware systems can be used to enhance communication between communities or teams, particularly if they support varied (e.g. video, audio, text - according to the needs of the individual firm), informal communication.

Apart from this, IT also has an important role through information management, by providing access to data and information, and allowing the manager to perform in-depth analyses. More than that, IT systems can also be programmed to spot trends in data and information and present that to the manager. This essentially enables the manager to make better decisions and aids knowledge creation by providing some of the building blocks for new knowledge.

IT tools can also be used in the innovation process (e.g. tools used in the actual product design), but these are outside the scope of knowledge management.

Conclusion

In conclusion, knowledge creation depends upon the mechanisms described in the subsection on knowledge sharing, combined with the ability to put knowledge into practice in an environment which supports interaction and experimentation. The creative process is a delicate one, and it is easily ruined by strict adherence to rules and regulations, or by bureaucracy. Similarly, IT systems must be

implemented with care (as discussed above), and not attempt to replace processes vital to knowledge creation.

Knowledge Acquisition

Knowledge acquisition refers to the knowledge that a firm can try to obtain from external sources. External knowledge sources are important, and one should therefore take a holistic view of the value chain (Gamble & Blackwell 2001). Sources include suppliers, competitors, partners/alliances, customers, and external experts. Communities of practice can extend well outside the firm.

Knowledge acquisition is a topic that could fill books and extend well outside the knowledge management (KM) focus. For this reason, detailed descriptions of how to manage external relationships are beyond the scope of this topic. However, since KM is inextricably linked to corporate strategy, an overview of the options available to the organization will be helpful to understanding the full potential KM role.

This subsection will discuss the knowledge available from the different sources, and the managerial issues that must be considered. In the subsection titled "External Knowledge Network", I will tie this back to the overall strategic level and look at the process behind external knowledge acquisition.

The main sources are of knowledge acquisition are:

Customers

Customer knowledge comes in different forms. Gerbert et al (2002) identify three different types:

- **Knowledge for customer:** The knowledge that the customers can gain in order to satisfy their knowledge needs. It can include product, market, and supplier knowledge. It can be sourced from our company or from other external sources like other customers and competitors (Zanjani 2008).
- **Knowledge about customer:** The kind of knowledge that enables us to know the customer better, to understand their motivations, and to address

them better. Includes requirements, expectations, and purchasing activities.

- **Knowledge from customer:** The kind of knowledge that deals with products, suppliers, and markets. It can be used to improve our products and services.

These three categories apply to actual knowledge acquisition as well as to data and information, which can be processed and used to create knowledge (Zanjani 2008); e.g. data on purchasing habits could be analyzed to create knowledge that could improve marketing or design decisions.

Knowledge sharing is thus important, although it may take many different forms depending on the area of business. KM is particularly important for B2B relationships where the buyers are usually more prominent (i.e. either buy many products or buy expensive products) and the products are more likely to be customized to the needs of the customer. This can, and often should result in a closer relationship with more detailed communication and feedback, where the customers are involved as partners when discussing modifications and improvements (Gerbert et al 2002).

Some possible KM initiatives thus include:

- Collecting feedback
- Collecting and processing marketing related information
- Collecting suggestions
- Involvement in development/design

Effective acquisition of customer knowledge is dependent on customer relationship management. IT can be used in this context both as a means of collecting feedback and enhancing communication and cooperation between partners (the principles of knowledge sharing apply here within the confines of the specific relationship). It is also useful as a way to gather data and information regarding sales, trends, feedback, and so on, which can then be used to create new knowledge within the organization.

Suppliers

Chan (2009) presents a classification for supplier knowledge based on the concepts outlined by Gerbert et al (2002) regarding customer knowledge. These are:

- Knowledge for suppliers: This is the knowledge that suppliers require and includes "production needs and forecasts, inventory, products, customers, and markets" (Chan 2009).
- Knowledge about suppliers: This is knowledge that is used to understand how the supplier can match the requirements of the organization; provide insight regarding quality, delivery, defects, financial risks etc.
- Knowledge from suppliers: This refers to the knowledge that suppliers have gathered from their dealings with the organization.

The KM initiatives and the role of IT are similar to the ones presented in the customer segment, with the organization now taking on the role of customer. Knowledge acquisition in this case also includes data and information which can be processed and used as building blocks for new knowledge creation.

Gamble and Blackwell (2001) refer to compatible goals, cultural alignment, and leadership commitment amongst the key factors for sustained, productive, long-term relationships.

Competitors

This deserves mention, but it is a fairly straightforward aspect of KM. It simply involves collecting, organizing and presenting the data, information, and knowledge that the firm has acquired in such a way that one can search, retrieve, and analyze it. Some of this falls within the scope of information management, but it is particularly the process of using these components to create better decisions and new knowledge that is of interest here.

IT systems are very useful in this case, since the sources are largely explicit and presumably require frequent updating and manipulation. Data mining and analysis, document management systems with suitable search functions, and expert systems are most relevant here.

Partners/alliances

Alliances intended to increase knowledge are a valuable potential resource. However, these must be properly managed. Key success factors include fostering trust, learning from your partner, and effectively managing the creation of knowledge relevant to both parties. Knowledge transfer can be facilitated by personnel exchanges, common projects and other forms of regular interaction, technology sharing, etc. (Gamble & Blackwell 2001). Focusing on informal communication, collaboration, and socialization is of paramount importance for valuable tacit knowledge acquisition and for extending communities of practice beyond the firm's borders.

Chan (2009) once again formulates a set of knowledge types based around the work of Gerbert et al (2002):

- **Knowledge for partners:** Knowledge which satisfies their needs, including "knowledge about products, markets, and suppliers" (Chan 2009).
- **Knowledge about partners:** Knowledge acquisition focused on understanding the ability of partners to perform their role in the relationship. Includes distribution channels, products, services, etc.
- **Knowledge from partners:** The knowledge that partners have accumulated from dealing with the organization.

IT can be used in this case very similarly to the way it is used inside the organization for knowledge sharing and knowledge creation (including data/information analysis) - in other words supporting communication, collaboration, experimentation, expertise location, analysis tools, etc. The exact system has to fit the nature of the relationship and the business model.

What is of particular importance in this case is to safeguard the system so that only that knowledge which the firm is willing to share becomes available. In the 80s, joint ventures between American and Japanese firms often resulted in a lopsided endeavor favoring the latter, since the Japanese were far more willing to listen, and the Americans were far more willing to talk. It is important to remember that the goal here is two-way learning; that a relationship will not last forever; and that a partner today may be a competitor tomorrow. KM must

therefore be very aware of what knowledge is being shared, and the IT systems must reflect this policy.

Merges & Acquisitions

This aspect deserves mention, but as a general discipline it is well beyond the scope of this paper. Dealing with mergers and acquisitions (M&A) is an extremely complex task that has led to numerous failures. Within the scope of knowledge acquisition, the area related to KM is how to pass on the most amount of relevant knowledge from the previous two organizations to the new, combined firm.

Very broadly speaking there are a couple of roles where KM efforts should feature heavily once the target has been acquired:

To identify the valuable/redundant knowledge sources in the target organization: This is a very difficult process since it involves understanding of the target company's tacit and embedded knowledge locked within people, communities, processes, networks, procedures, etc. One of the major causes of failure in M&A is that during the restructuring process, key people are let go by mistake or key communities are disrupted. The old adage that the company should be seen more like a living organism than a machine holds very true here.

To combine this (relevant) knowledge with the organization's knowledge assets to achieve synergy: This is the essence of many M&A; the notion that the whole should be greater than the sum of its parts. Integrating acquired companies is a difficult task, heavy on people management and the creation of a common culture. It is hard to say how much of this falls within KM specifically, and there certainly are no universal rules on this topic. Fundamentally, the same principles on knowledge sharing, reuse, and creation apply here, with a particular focus on culture, networks, and incentives, within a different and potentially hostile environment.

Other expertise

This refers to the other sources of external knowledge available to a firm and includes hiring new personnel or acquiring the services of consultants.

The role of KM in these cases is to make sure that the right knowledge is acquired. Essentially the process has two parts, on the one hand the strategic and tactical requirements of the firm must be taken into account, and on the other these must be compared to the knowledge assets of the organization.

If external services are acquired from consultants or other temporary service providers, KM must work together with strategic management to determine if this knowledge is worth integrating into the firm by assessing the need to reuse it in the future vs the cost of transferring it into the organization. If it is deemed as something that should be integrated, then the right learning situations must be established to transfer the knowledge into the firm. These could be mentoring relationships, use of project teams that include organizational members, courses and education, etc.

Knowledge Management Strategy

Introduction to Knowledge Management Strategy

While the knowledge management processes section dealt with the general ways knowledge can be managed, this section tackles long-term knowledge management strategy. Strategic investments represent the company's choices/options so as to enable and enhance the processes outlined earlier (e.g. knowledge sharing) and to offer help define which knowledge is relevant (i.e. in line with strategic objectives) and which is not.

This section is based on the strategic part of the integrated knowledge management model, which includes:

- Knowledge management strategic initiatives:
- Invest: Support of existing structures, competencies, knowledge retention mechanisms, culture, external network, and knowledge management systems
- Invest: Implement changes to structures, competencies, knowledge retention mechanisms, culture, external network, and knowledge management systems
- Divest: Remove obsolete knowledge

The articles that follow are based solely on the points under "invest". Based on that we arrive at the following headings:

- KM and Organizational Structures
- KM and Organizational Culture
- KM and Knowledge Retention
- KM and Core Competencies
- KM and External Knowledge Network
- KM and Knowledge Management Systems
- Summary: Knowledge Management Best Practices

As many of you might realize, many of the strategic initiatives deal with aspects that extend into different branches of management. I will endeavor to stick to the scope of this subsection and, for the most part, limit my discussion only to aspects relevant to knowledge management strategy. Furthermore, at all stages of the

following discussion on knowledge management strategy, I will also refer to different knowledge types and to IT systems, whenever necessary. However, the subsection dealing with knowledge management systems will be the first that focuses specifically on IT. It will discuss the general implementation issues, leading to the subsequent section that looks at some specific systems and tools.

At the end, I will present a summary of all the conclusions and recommendations made throughout this section and the one on knowledge management processes, in a subsection titled Knowledge Management Best Practices. This will serve as a way to provide a quick overview of knowledge management strategy and could be read on its own by readers who are not interested in a more detailed account.

Invest: Managing Organizational Structures

This discussion deals with the physical and non-physical divisions and barriers that influence the way knowledge management (KM) operate. By "organizational structure", I refer to the layout of the company itself and also to the various bodies that exist within it.

It is important to note that many elements within this topic stretch well outside our focus, and volumes could be written on it alone. The focus here will be only on the general elements that are directly related to KM.

Types of Organizational Structures

Organizational structures deal with the way the firm is organized, and the way people relate to one another. Broadly speaking, there are two types of organizational structure, namely formal and informal. These two concepts are not independent, and the formal structure may greatly influence informal networks, both positively and negatively.

Formal: The official structure of the organization, which is normally displayed on an organizational chart, and which denotes the hierarchical relationships between members of the firm. It is beyond the scope of this site to offer a discussion on the various formal organizational structures. However, there are a few things that are relevant to KM:

1. The formal organizational structure must not be so rigidly enforced so as to stifle informal structures such as communities of practice, where knowledge sharing, and creation may take place. It is the knowledge manager's job to understand the knowledge dynamics of the organization and to recognize how the formal and informal structures coexist.
2. The formal organizational structure, particularly in a larger firm with separate departments, will impact knowledge flows. There is no set structure that is best, since most have advantages and disadvantages depending upon the business type, firm size, etc. However, studies seem to

indicate that flatter, decentralized structures are more effective for KM (Choi & Lee 2000, Claver-Cortés et al 2007, Chen & Huang 2007). This also makes sense logically, since knowledge flows would be less hindered in such a structure.

Implementing changes to formal structures can thus mean restructuring the organization, but it can also mean enforcing existing structures to a lesser or greater degree.

Informal: The unofficial organizational structures are the ones that are created through informal networks, as a result of working within the organization. They represent the way people actually interact. Brown and Duguid (1992) advocated looking at the firm as a community of communities. Increasingly, the value of these informal structures is being understood, and the knowledge manager must learn to identify and support these networks. This process is closely related to KM, since knowledge flows and repositories (particularly tacit) are dependent upon these structures. KM therefore must play a central role in their management, including identification of the structures and the knowledge they hold, implementing changes, bridging gaps between communities, and so on. Unfortunately, implementing changes to informal social networks is difficult without running the risk of disrupting them. There are however several ways that managers can influence social networks:

- Generalists (sometimes referred to as gatekeepers) can be used to identify communities and their expert know-how, and to help coordinate activities such as cross-functional projects.
- Project teams and other teamwork can serve as a means to bridge the gap between communities.
- Common physical meeting areas can allow communities to grow and flourish.
- Virtual socialization and people finders can support communities of practice.
- Common vision, goals, ideals, social gatherings etc. and a climate of trust can serve as a way to lessen the distance between organizational members and communities.

Invest: Corporate Culture Change

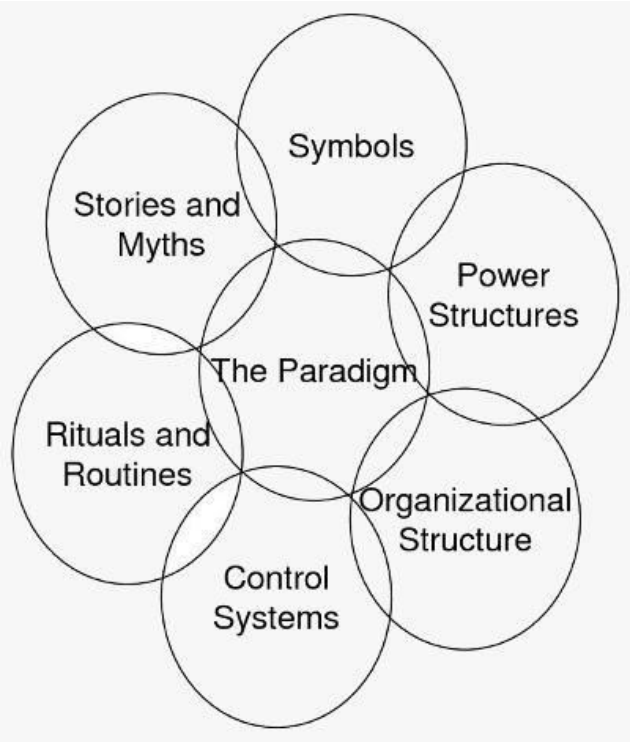
The concept of organizational/corporate culture has already been discussed in a previous subsection. I will therefore keep my introduction to the subject to a minimum, and instead focus almost exclusively on corporate culture change.

Organizational culture represents the way things are done in an organization, encompassing the values, beliefs, and attitude that generate a common framework for interpreting events.

Knowledge sharing, and thus all aspects related to knowledge management (KM), depend upon organizational culture. Trust is a particularly important issue, since workers need to feel secure that they are not jeopardizing themselves by engaging in knowledge sharing. In order for proper cooperation to take place, management must create a culture where knowledge sharing is seen as beneficial for the individual as well as the organization. Managing corporate culture change is therefore at the very core of KM and organizational learning processes.

Defining and Mapping Organizational Culture

Johnson (2001) presents a model called the cultural web (see below), outlining the various components of organizational culture.



The paradigm: The set of assumptions shared and taken for granted by the organization.

Rituals and Routines: These represent "the way we do things around here". They point to what is valued and include behaviors that are taken for granted as being correct.

Stories and myths: The organization's folklore that passes on the common perception of past events, thus reinforcing beliefs and passing them on to newcomers.

Symbols: All the symbolic elements of the firm, including titles and dress codes.

Control Systems: Systems that are designed to promote certain activities by rewarding correct behavior and monitoring performance.

Org. Structures: The formal structure of the organization, as explained in the subsection on organizational structures (though in this case it is considered solely in regards to its influence on culture).

Power structures: The more powerful groups are also most likely to be involved in shaping the paradigm. A big problem arises when "the main targets for change are also those who hold the power." (Bali et al 2009).

Johnson (2001) advocates culture mapping according to this framework so as to assess the culture as a whole and be able to determine its compatibility with strategy.

Managing Corporate Culture Change

Wellman (2009) presents a series of leadership roles that will help facilitate corporate culture change towards a knowledge friendly culture:

- Acknowledge the existence and influence of organizational culture: It must be brought into the open so people can see and understand how it affects activities
- Have a clear and persistent vision of what the culture should be and of what changes need to be applied: This vision must be understood by management at all levels and spread across the organization.

- Consciously manage culture: Wellman suggests the using health assessments and employee surveys to evaluate progress and direction. Expanding upon this, one might add the use of incentives (whatever is suitable within that particular organization) and of using managers as intermediaries between different cultures within the organization. Management must strive to create a culture where knowledge sharing is perceived as beneficial to the whole and also to the individual. In other words, through shared vision, incentives, etc. they must foster an atmosphere of trust to ensure that individuals have faith in the principle of reciprocity. They must also bridge cultural differences that exist between different communities and power structures within the organization.

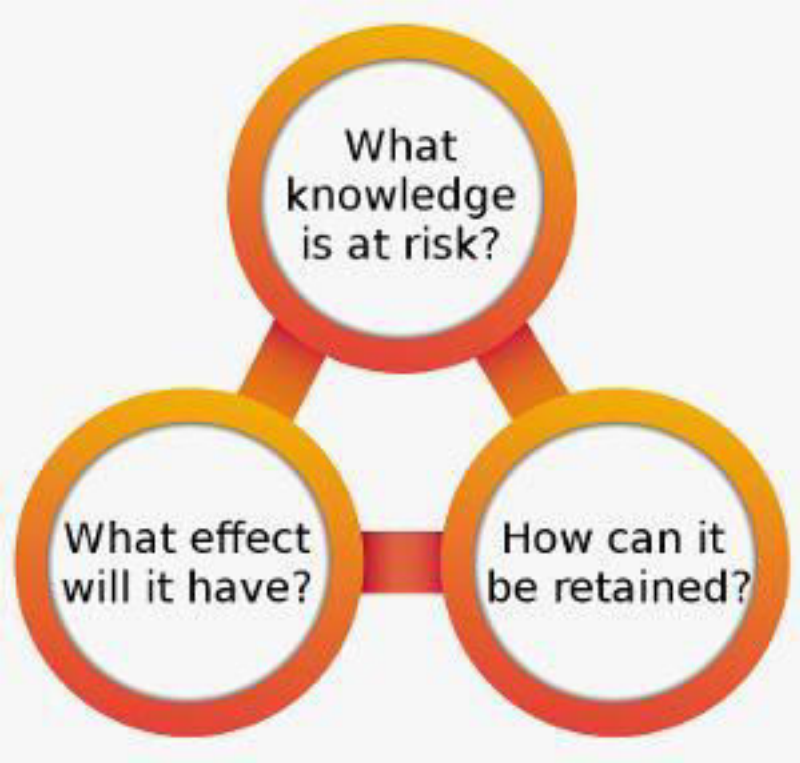
Gardner presents a somewhat more concrete approach to corporate culture change. He states that it is dependent on redefining the assumptions that shape the common understanding, or in other words the paradigm. It thus involves introducing "anomalies" that present a reality that cannot be true under the old assumptions. As more and more anomalies are presented, people will eventually abandon old beliefs and frames of understanding and eventually be willing to adopt new ones.

No matter what, corporate culture change is a difficult process that is likely to meet significant resistance. Its stubbornness is due in part to the fact that it is history dependent, woven into everyday practice, and used as socializing mechanism for newcomers (Beitler 2005). However, as Beitler argues, despite all the hurdles, managing culture simply must be done.

Invest: Knowledge Retention

Knowledge retention involves capturing knowledge in the organization so that it can be used later. In a previous section on organizational memory, Walsh and Ungson (1991) defined five knowledge repositories, namely individuals, culture, transformations (i.e. procedures & formalized systems), structures (e.g. formal and informal networks), and external activities. This is where knowledge can exist or be retained in an organization. In this section, we are interested in the managerial side, so as to answer the question: How can management promote the retention of (crucial) knowledge?

Most often, one hears of knowledge retention in the context of losing key employees and using techniques such as exit interviews to try to capture their knowledge. In reality, knowledge retention should be integrated into how the organization operates and start well before a key employee is about to depart. Although it is considered crucial for long term organizational success, few organizations have formal knowledge retention strategies (Liebowitz 2011).



A knowledge retention strategy as a part of knowledge management (KM) will identify the knowledge resources that are at risk and must be retained, and then implement specific initiatives so as to keep these resources in the firm. Like most other KM-related processes and strategies, success depends upon successful knowledge sharing and having a knowledge sharing & learning organizational culture.

Apart from the more general knowledge sharing initiatives that a firm may use - e.g. support of formal & informal knowledge networks (social areas, social media, meetings, company functions, knowledge fairs, expertise locator, etc.), changing the organization culture, etc. - examples of tools & techniques which can be used specifically for knowledge retention include (adapted from Smith 2007, Liebowitz 2009, and Liebowitz 2011):

- Implementing reward structures to encourage sharing of key knowledge.
- Use of project teams and cross-functional project teams.
- After-action reviews.
- Storytelling.

- Mentoring programs & job shadowing.
- Interviews & exit interviews.
- Job rotation.
- Company procedures/processes manuals.
- Taking advantage of the knowledge of retirees.

Knowledge Retention Strategy

Doan et al (2011) identify three basic questions that must be asked when considering knowledge retention:

- What knowledge may be lost?
- What are the organizational consequences of losing that knowledge?
- What actions can be taken to retain that knowledge?

Expanding upon these questions, one can outline several concrete steps necessary in the formulation of a knowledge retention strategy:

Step 1: Understand your risk factor: Liebowitz (2011) identified the following risks:

- he average age of your employees is high
- The company has placed insufficient focus on:
  - knowledge capture
  - mentoring program
  - employee training and development
- Information is difficult to find or is often misplaced.
- There is little informal communication in the organization.
- Many knowledgeable employees are leaving the organization.

Step 2: Understand which knowledge is critical and focus on this (Corney 2018) (read more about this under Knowledge Organization & Assessment)

Step 3: Formulate a strategy using the pillars of knowledge retention (Liebowitz 2009 & 2011): Knowledge retention consists of a wide range of tools, some easy and some hard to implement. Liebowitz identifies four categories which encompass all the initiatives within knowledge retention. These are:

- Recognition and reward structure: Management has the choice to use either intrinsic motivators (i.e. which make the job itself more satisfying,

such as praise or recognition) or extrinsic motivators (i.e. which offer benefits unrelated to the job, such as money) (Gamelgaard 2007). These must take organizational as well as national cultural factors into account (Gamelgaard 2007), but overall the most effective and longer lasting appear to be intrinsic motivators (Gamelgaard 2007 & Liebowitz 2009). However, a combination of both is usually the way to go.

- Bidirectional knowledge flow: Establishing a two-way system of knowledge capture, where knowledge is not only passed down from the senior employee to the junior employee, but also vice versa.
- Personalization and codification: Personalization refers to connecting people and includes tools such as mentoring, jon rotation, knowledge fairs, communities, and so on, while codification includes tools like after action reviews, various knowledge repositories, lessons learned systems, etc. (Liebowitz 2009).
- The golden gem: Bringing back important retirees in various capacities. This includes rehire programs, consultancy, part-time work, temporary jobs, etc. (Corporate Executive Board 2005). Using a phased retirement system (e.g. leave of absence – part time work – casual rehire) can also help to slowly lose a key employee and to gradually transfer all his key knowledge to the organization (Corporate Executive Board 2005).

Success Factors and DOs and DON'Ts of KR

Doan et al (2011), following a comprehensive review of knowledge retention literature, arrive at the following key success factors:

- Top management support
- Knowledge retention strategy
- Learning culture
- Human resource practices (since knowledge resides in people, knowledge retention is closely linked to HR practices including recruitment, education, rewards, and performance management)
- Information and communication technology tools

Similarly, Corney (2018) outlines some basic DOs and DON'Ts of knowledge retention:

- Do not capture "just in case". This leads to repositories of unused information.
- Make sure that you are focusing on capturing Critical Knowledge, i.e. knowledge that the organization would struggle without.
- When departures occur, offer them the chance to "leave a legacy" in an alumni network.
- Make sure that knowledge retention and capture is the "way we do things around here" and that it is part of any work process and at all stages of the employment cycle.

Invest: Knowledge Management and Core Competencies

The knowledge management definition presented earlier, involved the reuse and creation of relevant knowledge. The word relevant links knowledge management (KM) to the concept of organizational core competencies. Once again, the challenge here is to discuss this subject without diverging too much into related topics that are not directly relevant to KM.

Core competencies: Definitions vary greatly. The term was originally coined by Pralahad and Hamel (1990) who defined it as "the collective learning of the organization, especially how to coordinate different production skills and integrate multiple streams of technologies". Since then it has been defined in multiple ways, but very generally, core competencies refer to the firm's primary expertise, which is a source of sustained competitive advantage. Arriving at a more precise definition is not necessary for our purpose here. Suffice it to say, that these are key capabilities, which, from the resource-based perspective of the firm, are the primary drivers of innovation and competitive advantage.

Core competencies thus have a large knowledge component, and managing them is, in the very least, a product of corporate strategy working with KM and innovation management. This simplified model has strategy dictating the overall direction, KM managing the knowledge dynamics, and innovation management turning core competencies into profitable core products. To understand the role of KM let us look at a brief overview of how core competencies are managed:

1. Identifying and assessing core competencies: The firm should map out its key competencies, possibly linking them directly to specific core products. Then, an evaluation must take place, assessing what one has vs. what one needs to have (as determined by strategy and the competitive environment). KM is responsible for identifying where the key knowledge is located, including the tacit expertise and knowledge embedded in products, routines, etc., as well as identifying knowledge gaps.

2. Sustaining core competencies: Organizational core competencies, like all knowledge assets, have the virtue of improving rather than depreciating through use. Conversely, lack of use will lead to erosion of any skill set. The role of KM here is twofold, on the one hand, it must keep stock of the state of key knowledge assets and, on the other, it must leverage key knowledge assets across the organization.
3. Building core competencies: Building new core competencies involves an interplay between knowledge, practice, coordination, and refinement. Knowledge assets must be built, enhanced, combined, and coordinated in an environment that supports experimentation and improvement. Building core competencies can be a complicated endeavor since sustained competitive advantage is derived from assets that are hard to imitate (Dierickx and Cool 1989). From a KM perspective, this implies the buildup of specific tacit knowledge and expertise (i.e. uncodified knowledge that is generally more valuable, and inherently more difficult to copy and transfer), often across multiple departments or functions.
4. Unlearning core competencies: Organizations have a habit of trying to keep doing what they have always been doing. Unlearning a competency when it is no longer useful is one of the key aspects of a successful firm, and history is riddled with examples of companies that have failed to do so. In the process of unlearning, KM again plays an important role by identifying and managing the firm's knowledge assets in the right direction. This may be done through re-training, restructuring, creating new knowledge flows, external knowledge acquisition, outright removal, etc.

The specific dynamics of the processes of knowledge creation, knowledge acquisition, knowledge sharing, and knowledge reuse, which are central to the management of core competencies, have been discussed earlier. The purpose of this section is to emphasize that KM is not just a collection of individual initiatives. The buildup of skills and competencies, involving the coordination of multiple KM disciplines with other organizational functions, must often be managed according to long-term strategic goals and coordinated across the organization.

Invest: Managing the External Knowledge Network

Having explored the dynamics of knowledge acquisition from external sources, I will now briefly look at the role knowledge management (KM) has in the broader, long-term process of building an external knowledge network. Once again, I want to underline that this presentation is only intended as a broad overview of the potential roles of KM and will not go into any detail on specific topics such as customer or supplier relationship management.

In the previous subsection, the major potential external knowledge sources were identified as:

- Customers
- Suppliers
- Competitors
- Partners
- Mergers & Acquisitions

Each of these categories offer a different set of potential knowledge, as well as different challenges in the acquisition process.

Without looking specifically at KM, the general steps for extending the external knowledge network are as follows:

- Identification of potential partner/target: This would depend largely on the corporate strategic goals assessed against the perceived benefit of the potential partners.
- Evaluation of potential partner/target: This process is particularly important for high investment ventures like mergers and acquisitions or joint ventures. The process would be driven by the estimated contribution of the target (this includes knowledge and core competencies but also potentially other assets), the estimated cost of establishing the relationship, and the estimated cost of acquiring similar knowledge from other sources (including building it in-house). The word "estimated" plays a

key role here, since the information required to make accurate decisions is often hard to come by.

- Establishing the relationship/acquisition of target: The process of actually establishing cooperation/acquisition. For customer, supplier, or competitor relationships this may involve setting up procedures, rules, and intentions regarding the nature of the relationship and the things that will be reported or shared. For mergers and acquisitions it could take any number of forms and may include defining a new structure, integration into a common locale, merging corporate cultures/identities, and so on.
- Knowledge transferal/integration: The actual processes that are put in place to gather and use the knowledge and know-how from the relationship/acquisition. These may involve reporting procedures, feedback mechanisms, common IT systems, common projects etc.

The role of KM in building the external knowledge network would thus be to:

- Provide all the relevant information regarding internal knowledge assets: This includes identifying what the firm has, what it does not have, and the costs associated with building new knowledge.
- Help in the evaluation process: help evaluate the potential value and difficulty to integrate of the knowledge that the firm expects to acquire.
- Encourage knowledge sharing & integration: On the one hand it could involve working with top management so as to devise the best procedures and systems relating to knowledge transfer. On the other, it could involve introducing incentives, systems, managing organizational culture change, etc. that facilitate, support, and encourage knowledge sharing.
- Gather, integrate, and share relevant external knowledge and information: Managing the knowledge transfer process so as to ensure that the knowledge is relevant and that it is available whenever and wherever necessary. Analyzation of data and information so as to provide the building blocks of new knowledge.

As one can see, KM plays a supporting role in all areas and is instrumental in the learning process. Its importance will be greater the more knowledge intensive the industry and nature of the relationship.

Due to the complexity of these topics and the vastly different managerial requirements, I will end this discussion with just these general considerations.

Invest: Knowledge Management Systems

The issue of knowledge management systems has probably always been the most discussed and debated topic within knowledge management (KM). However, in modern KM, few people would disagree with the notion that knowledge management systems are an absolutely critical part of a KM initiative.

On this site, I have considered the impact of IT in all the knowledge management strategy subsections, with particular emphasis on its role in knowledge sharing. From this point on, the discussion will be organized as follows:

- This subsection will discuss the theoretical implementation of knowledge management systems and its impact on the organization.
- The section titled "KM Tools" will look at some of the main categories of systems available.

What are Knowledge Management Systems?

Knowledge management systems refer to any kind of IT system that stores and retrieves knowledge, improves collaboration, locates knowledge sources, mines repositories for hidden knowledge, captures and uses knowledge, or in some other way enhances the KM process.

If my explanation above makes the definition of these systems seem vague, that is because there is no consensus as to what constitutes a knowledge management system, much like there is no consensus regarding KM. Furthermore, since KM is involved in all areas of the firm, drawing a line is very difficult.

James Robertson (2007) goes as far as to argue that organizations should not even think in terms of knowledge management systems. He argues that KM, though enhanced by technology, is not a technology discipline, and thinking in terms of knowledge management systems leads to expectations of "silver bullet" solutions. Instead, the focus should be determining the functionality of the IT systems that are required for the specific activities and initiatives within the firm.

However, with proper implementation, IT systems have become a critical component of KM today.

For the purpose of this site (intended to be useful for those people that do search for terms like knowledge management systems), I will break these down into the following general categories (adapted from the work of Gupta and Sharma 2005, in Bali et al 2009):

- Groupware systems & KM 2.0
- The intranet and extranet
- Data warehousing, data mining, & OLAP
- Decision Support Systems
- Content management systems
- Document management systems
- Artificial intelligence tools
- Simulation tools
- Semantic networks

These categories will cover the vast majority of the systems that people would normally associate with a KM system.

Problems and Failure Factors

Too often, the effects of technology on the organization are not given enough thought prior to the introduction of a new system. There are two sets of knowledge necessary for the design and implementation of a knowledge management system (Newell et al., 2000):

1. The technical programming and design know-how
2. Organizational know-how based on the understanding of knowledge flows

The problem is that rarely are both these sets of knowledge known by a single person. Moreover, technology is rarely designed by the people who use it. Therefore, firms are faced with the issue of fit between IT systems and organizational practices, as well as with acceptance within organizational culture (Gamble & Blackwell 2001).

Botha et al (2008) stress the importance of understanding what knowledge management systems cannot do. They point to the fact that introducing knowledge sharing technologies does not mean that experts will share knowledge - other initiatives have to be in place.

Akhavan et al (2005) identify several additional failure factors including: lack of top management support, organizational culture, lack of a separate budget, and resistance to change.

Building upon all this, and incorporating previously discussed elements, failure factors of knowledge management systems are as follows:

- Inadequate support: managerial and technical, during both implementation and use.
- Expecting that the technology is a KM solution in itself.
- Failure to understand exactly what the firm needs (whether technologically or otherwise).
- Not understanding the specific function and limitation of each individual system.
- Lack of organizational acceptance, and assuming that if you build it, they will come – lack of appropriate organizational culture.
- Inadequate quality measures (e.g. lack of content management).
- Lack of organizational/departmental/etc. fit - does it make working in the organization. easier? Is a system appropriate in one area of the firm but not another? Does it actually disrupt existing processes?
- Lack of understanding of knowledge dynamics and the inherent difficulty in transferring tacit knowledge with IT based systems (see segment on tacit knowledge under knowledge sharing).
- Lack of a separate budget.

Promoting Acceptance and Assimilation

According to Hecht et al. (2011) the process of successful implementation has three stages: adoption, acceptance, and assimilation. Based on recognized models and theories, the authors identified three comprehensive sets of factors affecting

these three elements. The resulting model organized the KMS implementation factors into the following categories:

- Adoption:
- Influenced by design: Innovation characteristics, fit, expected results, communication characteristics.
- Not influenced by design: Environment, technological infrastructure, resources, organizational characteristics.
- Acceptance
- Influenced by design: Effort expectancy, performance expectancy.
- Not influenced by design: Social influences, attitude towards technology use.
- Assimilation:
- Influenced by design: social system characteristics, process characteristics.
- Not influenced by design: Management characteristics, institutional characteristics.

Step 1: KMS Adoption

Some of the key factors identified by Hecht et al (2011) are: characteristics, commercial advantage, cultural values, information quality, organizational viability, and system quality. To promote KMS adoption:

- Start with an internal analysis of the firm.
- Evaluate information/knowledge needs & flows, lines of communication, communities of practice, etc. These findings should form the basis of determining the systems needed to complement them.
- Make a thorough cost-benefit analysis, considering factors like size of firm, number of users, complexity of the system structure, frequency of use, upkeep & updating costs, security issues, training costs (including ensuring acceptance) etc. vs improvements in performance, lower response time, lower costs (relative to the previous systems) etc.
- Evaluate existing work practices and determine how the systems will improve - and not hinder - the status quo.
- One very interesting rule of thumb presented by Botha et al (2008), is that "the more tacit the knowledge, the less high-tech the required solution". For example, expert knowledge is often best supported by multimedia

communication technology and by expert finders. Beyond that, it is about human interaction and collaboration.

Step 2: KMS acceptance

Some of the factors outlined by Hecht et al. (2011) include: anxiety, ease of use, intrinsic motivation, job-fit, results demonstrability, and social factors. Promoting acceptance can be improved by:

- Involve the users in the design and implementation process when possible (Liebowitz 1999).
- Involve the user in the evaluation of the system when applicable (Liebowitz 1999).
- Make it as user friendly and as intuitive as possible (Frank 2002).
- Support multiple perspectives of the stored knowledge (Frank 2002).
- Provide adequate technical and managerial support.
- Use product champions to promote the new systems throughout the organization.

Step 3: KMS Assimilation

Some of the factors identified by Hecht et al. (2011) include: knowledge barrier, management championship, process cost, process quality, and promotion of collaboration. Assimilation can be improved by:

- Content management (Gamble & Blackwell, 2001): In order for the system to remain useful, its content must be kept relevant through updating, revising, filtering, organization, etc.
- Perceived attractiveness factors (Gamble & Blackwell, 2001): This includes not only the advantages of using the KMS, but also of management's ability to convince users of these advantages.
- Proper budgeting: i.e. planning expenses and implementing a KMS that is cost efficient.
- Focus on collaboration. In particular, consider the adoption of enterprise 2.0 / KM 2.0 systems, which by design promote collaboration while generally being inexpensive and often quite popular.
- Management involvement: The system must be championed by management at all levels.

Naturally, these factors do not apply to all systems. Some are fairly straightforward and accepted in today's society (e.g. email). However, the strategic implications of implementing knowledge management systems that significantly aim to change the way things are done in the organization requires proper consideration and careful planning. Moreover, with the evolution of systems to better support different facets of KM, they should be regarded as a critical component in the implementation of the discipline.

Summary: Knowledge Management Best Practices

This section offers an overview of the main points discussed thus far in the knowledge management processes and knowledge management strategy sections.

First, let us take a step back and look at the enablers of knowledge management (KM). According to Botha et al (2008) these are:

- **Culture:** One which is supportive of knowledge management, and the processes it implies - particularly knowledge sharing.
- **Infrastructure:** Support systems, teams, structures, and collaboration.
- **Measures:** Developing a process and design for managing change.
- **Technology:** Can offer great advantages, particularly with the management of explicit knowledge, as a collaboration tool, and as an expert locator. However, technology should not be misused – it is just one important component of a KM strategy.

According to the authors, these aspects are what make KM possible. For instance, KM initiatives implemented in a company with a competitive culture that shuns knowledge sharing are doomed to fail from the start. I would not go as far as to call technology an enabler, but it is an important aspect nonetheless and an unavoidable part of any modern knowledge management best practices.

With this in mind, I will now recap the main KM processes. The knowledge management best practices summary below will cover all the categories mentioned above.

Determining the Organization's Knowledge and Know-how

- **Knowledge Discovery and Detection:** Refers to the processes of identifying existing knowledge sources, as well as discovering hidden knowledge in data and information. This knowledge resides both inside the organization and externally, in customers, suppliers, partners, etc.
    - Explicit knowledge: Document management, intelligence gathering, data mining, text mining etc. IT is useful/crucial in this respect.

    - Tacit knowledge: Includes tools/practices such as knowledge surveys, questionnaires, individual interviews, group interviews, focus groups, network analysis, and observation. IT has a more indirect role here.
    - Embedded knowledge Includes observation, analysis, reverse engineering, and modeling tools to identify knowledge stored within procedures, products, etc.
- **Knowledge Organization & Assessment:** The process of mapping, categorizing, indexing, and evaluating organizational knowledge assets.
    - This is heavily supported by IT, which can use complex categorization and retrieval mechanisms to organize knowledge assets in multiple ways.
    - Tacit (embodied) knowledge: This is done through the use of focus groups, expertise guides, and knowledge coordinators (Gamble & Blackwell 2001).
    - Embedded knowledge: Tools include job/workplace design, workflow analyses and performance measures (Gamble & Blackwell 2001)

Practical Knowledge Management Best Practices

- **Knowledge Sharing:** Perhaps the most important process in KM, it plays a determinant role for both knowledge reuse and knowledge creation. The factors below summarize the key considerations with the exception of cultural issues, which are discussed further down.
    - Explicit knowledge: Depends on articulation of needs, awareness of knowledge, access to knowledge, guidance in the knowledge sharing process, and completeness of the knowledge sources (Bukowitz & Williams 1999). IT systems and content management are extremely important in this process.
    - Tacit (embodied) knowledge: This depends on socialization, particularly within informal networks. Culture is particularly important in this area. Tacit knowledge can rarely be effectively codified without losing the essence that makes it so valuable to begin with, so the focus should be on supporting work relationships. IT has a secondary supporting role in

this context, primarily as an expert finder and as offering support in the socialization process (e.g. through groupware applications).
    - Embedded knowledge: Use of scenario planning, after action reviews, and management training (Gamble & Blackwell 2001). IT has a role in mapping, modeling, creating simulations, and as an embedded knowledge repository.
- **Knowledge Reuse:** Involves three roles, the knowledge producer, intermediary, and consumer (Markus 2001), which are involved in creating, preparing, and actually reusing the knowledge. Two keys elements here are culture and cost - particularly relating to tacit knowledge (where indexing the source rather than the knowledge itself is often more viable). Markus identifies four reuse situations:
    - Shared work producers
    - Shared work practitioners
    - Expert seeking novices
    - Miners of secondary knowledge
- **Knowledge Creation:** This process depends upon knowledge sharing (as defined above), collaboration, and access to relevant information and data. Cook and Brown (1999) suggest that knowledge creation is an interplay between knowledge and knowing, or in other words, putting knowledge into practice. The role of management in this process was identified as:
    - Enabling knowledge sharing: As above
    - Creating suitable work-related environments: The focus here is on unstructured work environments where experimentation, trial and error, and theory in use are promoted. Self-organizing, semi- or fully-autonomous project teams are identified as one useful tool in this endeavor.
    - Providing access to collaborative IT systems: Groupware applications can be used for this purpose. These must support and not interfere with the ideal work environment.
    - Providing access to relevant data and information: From information systems, data warehouses, data mining, etc. These can act as building blocks in the knowledge creation process.

- **Knowledge Acquisition:** The firm can acquire knowledge externally from customers, suppliers, competitors, partners, and mergers. The role of KM varies in each process (as does the type of available knowledge), but at its core its function is to establish the right channels to transfer relevant knowledge from existing partnerships into the firm, and to integrate this knowledge as best as possible. To do so, KM can use a wide range of tools including:
  - Common IT systems
  - Common projects
  - Interaction and socialization
  - Involvement of partners in certain organizational processes (e.g. design)
  - Cultural alignment (for mergers or joint ventures)
  - Setting up the right incentive systems
  - Identifying and protecting crucial knowledge assets: when such knowledge should not be shared with a partner

Strategic Knowledge Management Best Practices:

- **KM and Organizational Structures:** Two types were defined: formal and informal.
  - Formal structure: These will interfere with KM if very rigidly enforced. The choice of structure, and the physical division of the firm, will also affect knowledge flows. Studies seem to show that decentralized structures seem to be best for KM (Choi & Lee 2000, Claver-Cortés et al 2007, Chen & Huang 2007).
  - Informal structures: The firm should be perceived as a community consisting of a collection of communities (Brown & Duguid 1992). Management can affect these through the use of project teams, teamwork, social functions, etc.
- **KM and Organizational Culture Change:** This must be recognized and managed carefully and deliberately. By introducing anomalies that challenge the accepted premises of organizational culture, management can influence organizational members to abandon certain aspects in favor of others (Gardner 1997). Use of incentives and common vision and goals

are also effective tools. One of the most important goals is to create a culture where knowledge sharing is perceived as beneficial rather than detrimental to the individual.

- **KM and Knowledge Retention:** Knowledge retention is the part of KM that is concerned with making sure that important knowledge assets remain in the firm over time, e.g. when key employees leave the firm or retire. Formulating a knowledge retention strategy depends upon understanding which knowledge is important, which knowledge is at risk and what it takes to keep this knowledge in the organization. Depending upon its knowledge retention strategy a firm may choose to implement one of many initiatives and tools including reward structures, mentoring, interviews, and utilizing knowledge from retirees.
- **KM and Core Competencies:** The management of core competencies consists of four processes: identifying, sustaining, building, and unlearning. KM plays a key supporting role throughout this process by:
  - Identifying what the firm knows, and what its main expertise is.
  - Leveraging knowledge assets across the organization.
  - Building the right know-how and expertise to match strategic requirements.
  - Isolating and removing/changing obsolete knowledge.

- **KM and the External Network:** As mentioned before, external knowledge sources include customers, suppliers, competitors, partners, mergers, etc. KM plays a role in the assessment of potential partners, by helping to determine what the organization knows, what it needs to know, and the best ways of getting that knowledge. It is also a key element during the cooperation process to ensure that the right knowledge is transferred and integrated into the organization.
- **KM and Knowledge Management Systems:** This very ambiguous category of systems refers to most systems used in the sharing, discovery, and creation of knowledge. Failures are generally due to an over reliance on technology, a lack of understanding of the limitations of these systems, improper fit with organizational practices, lack of acceptance, etc. Proper implementation implies paying attention to:

- Organizational fit: Carry out internal assessment of needs and work practices, cost-benefit analysis, etc.
- Organizational acceptance: by involving the user in the design and implementation, through managerial and technical support, and with product champions, etc.
- Continued use: A function of perceived attractiveness factors and content management (Gamble and Blackwell 2001).

This concludes the summary of knowledge management best practices. KM is a process that spreads throughout the organization. Its scope is difficult to define, and its effects are hard to measure - e.g. how do you determine the ROI on a discipline designed to subtly improve most aspects of the organization? Nonetheless, if properly implemented, it is a worthwhile investment that will promote efficiency, learning, innovation, and competitive advantage.

Knowledge Management Tools by Category (IT Based)

Introduction to Knowledge Management Tools

In this section, I present an overview of the IT-based tools and systems that can help knowledge management (KM) fulfill its goals.

The scope of this section is to provide the reader with an overview of the types of KM tools available on the market today and to gain an understanding of what their role is in the KM process. This is the most important step, since there are literally thousands of options to choose from. However, in the future, I intend to also take a look at some actual KM tools and present a few reviews.

To recap, I have dealt with KM tools throughout the section on tactical management initiatives, outlining its role in knowledge discovery, organization, sharing, etc. In the section on knowledge management strategy, I presented an article on knowledge management systems implementation, where I stated that IT based tools, for the most part, fall into one of the following categories (adapted from Gupta and Sharma 2005, in Bali et al 2009):

- Groupware systems & KM 2.0
- The intranet and extranet
- Data warehousing, data mining, & OLAP
- Decision Support Systems
- Content management systems
- Document management systems
- Artificial intelligence tools
- Simulation tools
- Semantic networks

For now, in the subsections that follow, I will discuss the first six KM tool categories on this list, as well as any other (sub)categories that may be relevant. Simulation tools is too broad a category for the scope of this site, and artificial intelligence systems are of questionable usefulness and are outside my area of expertise. However, in the (not too near) future, I do plan to add a segment on semantic networks and artificial intelligence.

A quick note on artificial intelligence: While there was much excitement about this a few years ago, to my understanding, it has not lived up to its expectations (yet). Expert systems for example, designed to capture human decision-making and to make the correct decisions in certain circumstances, have not been so successful due to constantly changing requirements (Botha et al 2008). For more on this, research topics such as neural networks, intelligent decision support systems, and expert systems.

Again, I would like to remind the reader that KM is about managing people, culture, and organizational practices & structures. However, in conjunction with sound practice, KM tools are invaluable at providing support to KM initiatives and at facilitating interaction, exchange of ideas, locating experts, and storing knowledge in both structured and unstructured forms. While it can be said that these tools were not absolutely necessary when KM peaked at the turn of the last century, today they are a necessary competitive advantage within knowledge sharing.

If IT is used right - as a supporting and enhancing mechanism for sound, existing KM practices - it can be a very valuable tool indeed.

Groupware Systems & Knowledge Management 2.0

Groupware is a term that refers to technology designed to help people collaborate and includes a wide range of applications. Wikipedia defines three handy categories for groupware:

- Communication tools: Tools for sending messages and files, including email, web publishing, wikis, filesharing, etc.
- Conferencing tools: e.g. video/audio conferencing, chat, forums, etc.
- Collaborative management tools: Tools for managing group activities, e.g. project management systems, workflow systems, information management systems, etc.

The best-known groupware system is Lotus Notes.

If designed and implemented properly, groupware systems are very useful when it comes to supporting knowledge management (KM). They can greatly facilitate explicit knowledge sharing through publishing and communication tools. They can support the knowledge creation process with collaborative management tools - although this process is still very much about people interacting and experimenting. Finally, they have some limited benefit to tacit knowledge transfer by supporting socialization through tools like video conferencing and informal communication. Expert finders are also beneficial for facilitating the location of tacit sources of knowledge (i.e. the right expert).

Web 2.0, Enterprise 2.0, & Knowledge Management 2.0

In recent years, the term web 2.0 has appeared to describe the increasingly popular tools that promote two-way communication on the internet. These social tools include blogs, wikis, social bookmarking, commenting, shared workspaces, micro blogging and polling (Bebensee et al. 2010). They differ from traditional publishing in that they "put the knowledge sharing power in the hands of the users themselves" (Gurteen, 2012).

The web 2.0 tools that have been applied within organizations have been called enterprise 2.0 (Bebensee et al., 2010), and even more recently, the mapping of these principles to KM has been dubbed KM 2.0 (Gurteen, 2012).

It is fair to say that KM 2.0 is very much in its early stages. For this reason, I will discuss it separately from the very general groupware subsections below.

The value of Knowledge Management 2.0: According to Cronk (2011, p. 84), web 2.0 tools "facilitate the development of social capital through knowledge sharing, which in turn increases the potential to create intellectual capital." The author defines social capital as the total resources existing across social networks. Wright et al. (2010) find that the adoption of social media is not being championed by KM to the extent that one might expect, representing a missed opportunity.

Limitations of Knowledge Management 2.0: Enterprise & KM 2.0 systems can suffer from the same failure factors as other KMS (more on this in the sections below). A failure example is presented by Garcia-Perez & Ayres (2009), who outlined the failure of an enterprise wiki. The study found that time needed to access & contribute to the wiki as well as the achievement of critical mass (i.e. having an adequate ratio of contributors) were failure factors. Furthermore, the authors warn that just because when asked employees claim that they will share knowledge, that does not actually mean they will do so when the system is implemented.

Considerations for Groupware Acquisition/Design

When acquiring or developing groupware it is important to establish the functions that best match the organization's needs (further considerations for IT implementation can be found in the knowledge management system subsection). Remember, these are not solutions, they are at most enablers of KM.

Determine the processes that take place in the organization as well as how knowledge is currently stored and distributed and establish how certain functions would improve them. Focus on the informal - both in terms of communication as well as the organizational networks and communities - so as to enhance rather than stifle creativity and innovation, and to increase the probability of acceptance.

Cheah (2007) points to the fact that many off the shelf groupware solutions could be greatly improved. For instance, email clients are designed in such a way so as to focus on the current email, but generally have limited functions for drawing knowledge and information from past mails. Document management systems also can be limited in their ability to extract knowledge from old documents. In both cases he suggests improved utilization of user-input metadata (including keywords that are weighed by importance) and categorization mechanisms, which would allow for effective knowledge mining in the future.

The point I am making by including this is that all groupware is not equal, and one should consider the functions from the perspective of long-term knowledge reuse (when applicable). For this to be possible, the intermediary knowledge packaging/sanitizing/categorizing process must be done in light of future expectations and requirements.

Groupware Implementation Issues

Groupware implies that workers are willing and able to work together and to share their knowledge. Implementation of groupware systems have had numerous failures. These have been attributed to:

"lack of top executive support, the proliferation of incompatible collaborative tools, installation of inadequate tools, end-user confusion, and existing work practices that are designed around individual rather than collaborative work" (Jones 2005 in Janson et al 2008).

Janson et al (2008) highlight that the success of groupware implementation hinges on the success that the organization has had in developing a culture where collaboration and sharing are the norm. Without that, there is no incentive to use the systems to their full potential.

The issue of standardization should also be considered. Will the systems be used in the same way and with the same rules throughout the organization? This should not be enforced if it may lead to a lack of acceptance and/or if it is not practically feasible.

Selection of the groupware systems should be influenced by the users or in the very least be carried out by someone who is knowledgeable in both the functions

of the system and the work practices of the users. Too often, this is not the case, and the decision is made at the top levels of the organization, by individuals who hardly ever operate the system (Grudin 2003 in Janson 2008).

Consider also how the chosen tools relate to one another, and if one should invest in an integrated solution. For instance, an integrated groupware system composed of many complementary modules may be easier on the user since it implies getting accustomed to one brand. The same systems manufactured by different companies could be far harder to learn. At the same time, they may not offer as many features individually, and this too must be carefully balanced against the firm's specific needs.

The Intranet & Extranet

The intranet is essentially a small-scale version of the internet, operating with similar functionality, but existing solely within the firm. Like the internet, the intranet uses network technologies such as Transmission Control Protocol/Internet Protocol (TCP/IP). It allows for the creation of internal networks with common internet applications that can allow them to communicate with different operating systems (Newell et al 2000).

Although it need not be, the intranet is usually linked to the internet, where broader searches are implemented. However, outsiders are excluded through security measures such as firewalls.

The Role of the Intranet

The intranet can be a very useful tool in the knowledge management process. It allows for the integration of multimedia communication and can act as a platform for groupware applications and publishing. It is intended to enhance collaboration, productivity, and socialization, but also to influence organizational culture and to act as a repository for embedded knowledge.

Robertson (2009) identifies seven key roles of the intranet homepage:

1. news
2. navigation
3. key tools
4. key information
5. community and culture
6. internal marketing
7. collaboration

The focus is to provide a useful site that enhances work practices, communicates key information, provides the right navigation tools, and helps define organizational culture. Many factors have to be balanced to create the right homepage, including quality of content, site design, site navigation, site & content

maintenance and updates, and the application of tools that are directly useful to the business processes and networks. The objectives of the intranet will also vary depending on the individual business and may focus more on certain aspects than others.

Perhaps the most important function of the intranet is knowledge sharing and collaboration. The main functions supporting this are (Damsgaard & Scheepers 1998 in Newt et al 2000):

- **Publishing:** E.g. homepages, newsletters, documents, employee directories.
- **Searching:** The intranet can integrate different search functions, e.g. through a search engine or using a system of categorization.
- **Transacting:** Allows user to make transactions with other web/intranet homepages.
- **Interacting:** Collaborative applications and other groupware, expert finders, directories, etc.
- **Recording:** It can be used as a storage medium for such elements as procedures, best practices, and FAQs (embedded and explicit knowledge).

Successful Intranet Implementation

Naturally, the implementation of the intranet must be done in line with organizational needs, processes, and objectives, as outlined in the section on implementation of knowledge management systems.

One specific and key concern is the selection of the search engine. Google offers an option for on-site search, which you can read more about here.

In his article, "The Ten Best Intranets of 2011", Jakob Nielsen (2011) indicates that the best intranets implemented solutions in the following areas:

- **Knowledge sharing:** This aspect is very similar to what I have discussed so far on this site and includes the sharing of all manner of explicit knowledge, but also connecting people that require assistance to experts that can help them.

- **Innovation management:** By incorporating tools that support the recording and management of new ideas.
- Comments: This is an easy way to allow users to contribute with their insight. This type of loose, unstructured communication can provide some limited tacit knowledge transfer and can encourage participation.
- **Ratings:** An even quicker, albeit shallower, way for people to point to good sources of knowledge.
- Participation rewards: Point systems, badges, and other symbolic rewards actually increase participation. Sometimes non-symbolic rewards (i.e. actual prizes) were used.
- **Customized collections:** By allowing users to customize content collections, one can bypass the shortcoming of never being fully able to predict a user's knowledge and information needs.

The Extranet

The extranet is an extension of the intranet to the firm's external network, including partners, suppliers and so on. The term is sometimes used to refer to a supplementary system working alongside the intranet or to a part of the intranet that is made available to certain external users.

The extranet provides a shared network with limited, controlled access to organizational information and knowledge resources, and uses security protocols, such as authentication, to limit access. An extranet can enhance collaboration and information transfer with partners in the external network.

Security is a key concern, and a firm must protect its crucial knowledge and information resources. This can be done using firewalls, use of encryption, and simple or strong authentication. Simple authentication involves usernames and passwords, while strong authentication makes use of digital certificates.

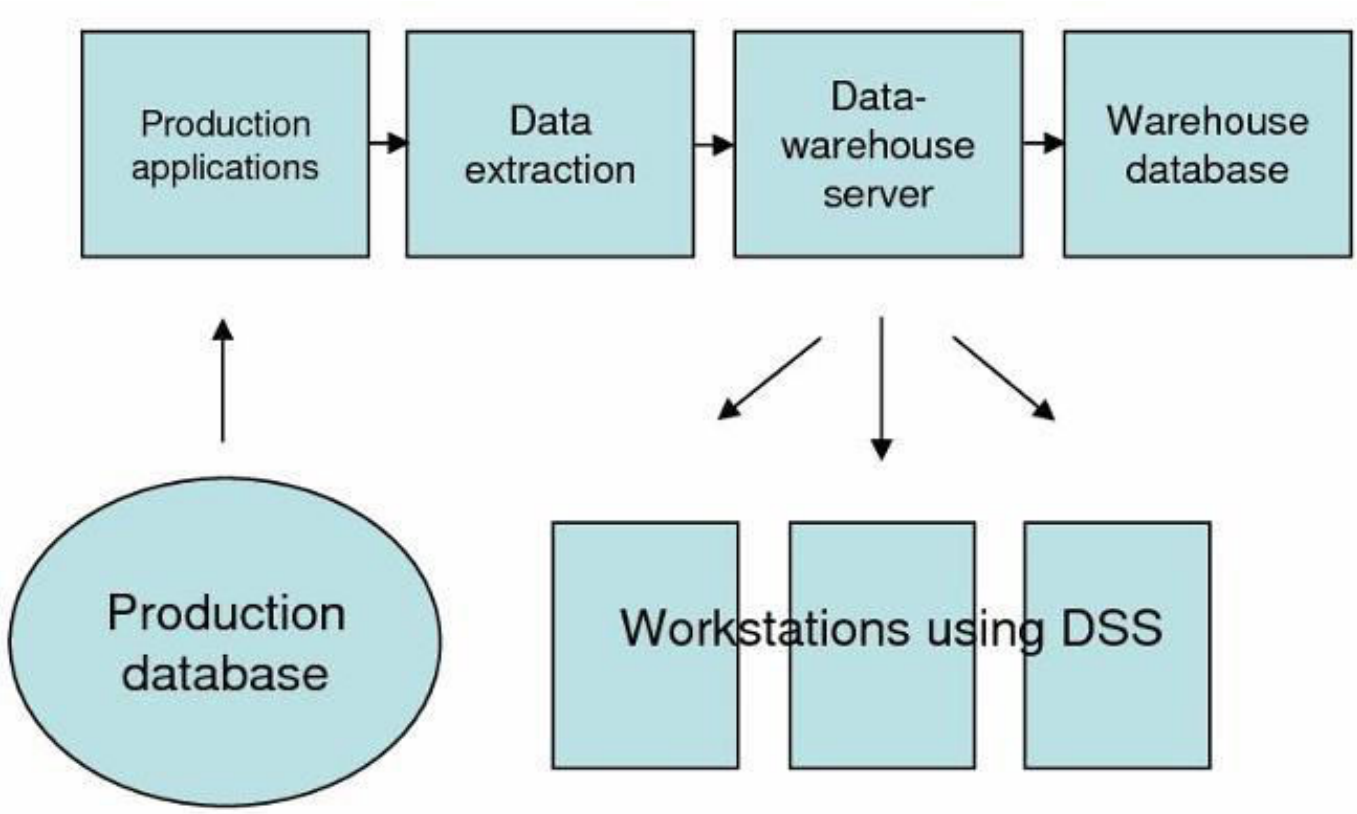
The content of both intranets and extranets is usually managed with a content management system.

Warehousing Data: The Data Warehouse, Data Mining, and OLAP

Warehousing data is based on the premise that the quality of a manager's decisions is based, at least in part,on the quality of his information. The goal of storing data in a centralized system is thus to have the means to provide them with the right building blocks for sound information and knowledge. Data warehouses contain information ranging from measurements of performance to competitive intelligence (Tanler 1997).

Data mining tools and techniques can be used to search stored data for patterns that might lead to new insights. Furthermore, the data warehouse is usually the driver of data-driven decision support systems (DSS), discussed in the following subsection.

Thierauf (1999) describes the process of warehousing data, extraction, and distribution. First data extraction of operational production data takes place, and this data is passed on to the warehouse database. A server hosts the data warehouse and the DSS. This server then passes on the extracted data to the warehouse database, which is employed by users to extract data through some form of software.



Theirauf's model for data warehousing is as follows:

Warehousing Data: Design and Implementation

Tanler (1997) identifies three stages in the design and implementation of the data warehouse. The first stage is largely concerned with identifying the critical success factors of the enterprise, so as to determine the focus of the systems applied to the warehouse. The next step is to identify the information needs of the decision makers. This involves the specification of current information lacks and the stages of the decision-making process (i.e. the time taken to analyze data and arrive at a decision). Finally, warehousing data should be implemented in a way that ensures that users understand the benefit early on. The size of the database and the complexity of the analytical requirements must be determined. Deployment issues, such as how users will receive the information, how routine decisions must be automated, and how users with varying technical skills can access the data, must be addressed.

According to Frank (2002), the success of the implementation of the data warehouse depends on:

- Accurately specifying user information needs
- Implementing metadata: Metadata is essentially data about data. This is regarded as a particularly crucial step. Parankusham & Madupu (2006) outline the different roles of metadata as including: data characterization and indexing, the facilitation or restriction of data access, and the determination of the source and currency of data. They further identify the lifecycle of metadata as:
  - Collection: Identification and capture
  - Maintenance: Updating of metadata to match changes in data architecture
  - Deployment: Users access the relevant metadata, based on their needs.

To this, we can add the 5 criteria presented on the www.syntelinc.com website:

- Recognize that the job is probably harder than you expect: A large portion of the data in data warehouses is incorrect, missing, or input in such a way that it is not usable (e.g. historical databases that have not been updated to modern schemas).
- Understand the data in your existing systems: Analyze existing databases. Identify relationships between existing data systems so as to avoid inconsistencies when these are moved to the warehouse.
- Be sure to recognize equivalent entities: Identify equivalent entities in heterogeneous systems, which may appear under a different name.
- Emphasize early wins to build support throughout the organization
- Consider outsourcing your data warehouse development and maintenance: Implementing a data warehouse can be a huge task that can often be better handled by experts. Many data warehousing applications are suited for outsourcing.

If properly designed and implemented, the goal of warehousing data is to drastically reduce the time required in the decision-making process. To do so, it employs three tools, namely Online Analytical Processing System (OLAP), data mining, and data visualization (Parankusham & Madupu 2006).

OLAP

OLAP allows three functions to be carried out.

- Query and reporting: Ability to formulate queries without having to use the database programming language.
- Multidimensional analysis: The ability to carry out analyses from multiple perspectives. Tanler (1997) provides an example of a product analysis that can be then repeated for each market segment. This allows for quick comparison of data relationships from different areas (e.g. by location, time, etc.). This analysis can include customers, markets, products, and so on,
- Statistical analysis: This function attempts to reduce the large quantities of data into formulas that capture the answer to the query.

OLAP is basically responsible for telling the user what happened to the organization (Theirauf 1999). It thus enhances understanding reactively, using summarization of data and information.

What is Data Mining?

This is another process used to try to create useable knowledge or information from data warehousing. Data mining, unlike statistical analysis, does not start with a preconceived hypothesis about the data, and the technique is more suited for heterogeneous databases and date sets (Bali et al 2009). Karahoca and Ponce (2009) describe data mining as "an important tool for the mission critical applications to minimize, filter, extract or transform large databases or datasets into summarized information and exploring hidden patterns in knowledge discovery (KD)." The knowledge discovery aspect is emphasized by Bali et al (2009), since the management of this new knowledge falls within the KM discipline.

It is beyond the scope of this site to offer an in-depth look at the data mining process. Instead, I will present a very brief overview, and point readers that are interested in the technical aspects towards free sources of information.

Very briefly, data mining employs a wide range of tools and systems, including symbolic methods and statistical analysis. According to Botha et al (2008), symbolic methods look for pattern primitives by using pattern description

languages so as to find structure. Statistical methods on the other hand measure and plot important characteristics, which are then divided into classes and clusters.

Data mining is a very complex process with different process models. One is the Cross-Industry Standard Process for Data Mining (or Crisp-DM). The process involves six steps (Maraban et al, in Karahoca & Ponce 2009):

Business understanding -> data understanding -> data preparation -> modeling -> evaluation -> deployment

For more on data mining see the book "Data Mining and Knowledge Discovery in Real Life Applications", edited by Ponce & Karahoca (2009), available for free from intechopen.com where numerous other potentially relevant resources can also be downloaded.

Data Visualization

This process involves representing data and information graphically so as to better communicate its content to the user. It is a way to make data patterns more visible, more accessible, easier to compare, and easier to communicate. Data visualization includes graphical interfaces, tables, graphs, images, 3D presentations, animation, and so on (Turban & Aaronson in Parankusham & Madupu 2006).

DSS are other tools used in conjunction with warehousing data. These are discussed in the following subsection.

Decision Support Systems

There are several kinds of such systems, however, in this subsection I will look at only at data-driven decision support systems (from now on referred to solely as decision support systems). The role of these systems is to access and manipulate data. They usually work with a data warehouse, use an online analytical processing system (OLAP), and employ data mining techniques. The goal is to enhance decision-making and solve problems by working with the manager rather than replacing him.

A decision support system can be a valuable tool. However, in order to be able to provide the information that each expert would find relevant, the user must be involved in the development and the post audit evaluation of the decision support system (Liebowitz 1999). This involvement must span not just the content issues, but also the presentation and the organization of the information. This is necessary to ensure that the system fulfills the three criteria that determine its success, namely compatibility, understandability, and effectiveness (Rouse in Liebowitz 1999).

If these three criteria are met, decision support systems can be invaluable in expanding the scope of information that each expert can handle. As a result, cognitive limitations become less important in determining the amount of source material that the expert can use.

One advantage and limitation of the decision support system is that it is user driven. This implies that the system answers queries what the expert inputs but does not carry out further analysis on its own. It is therefore not a form of artificial intelligence like other decision-making tools.

Knowledge management (KM) is involved in two ways here. Normally the area that is emphasized is that decision support systems can enhance the manager's knowledge through knowledge discovery and supply of relevant information. However, knowledge and KM activities are key components in how the manager uses the system, i.e. the direction of the analysis that he carries out, and the

knowledge that he is looking for. Kiku (2006) emphasizes that a decision support system must be designed in light of KM. An effective decision support system thus requires that the organization:

- Investigates the decisions made within their firm
- Compares these decisions with KM activities
- Evaluates any current decision support system in light of this
- Modifies said system if necessary

Content Management Systems

Content management systems are very relevant to knowledge management (KM) since they are responsible for the creation, management, and distribution of content on the intranet, extranet, or a website. Content management is a discipline in itself, so this section will be relatively brief, only outlining the basic considerations.

- A content management system may have the following functions:
- Provide templates for publishing: Making publishing easier and more consistent with existing structure/design.
- Tag content with metadata: I.e. Allowing the input of data that classifies content (e.g. keywords) so that it can be searched for and retrieved.
- Make it easy to edit content
- Version control: Tracking changes to pages and, if necessary, allowing previous versions to be accessed
- Allow for collaborative work on content
- Integrated document management systems
- Workflow management: Allowing for parallel content development
- Provide extensions and plug-ins for increased functionality
- Etc.

Content management systems come in different forms (and prices), and an organization must carefully evaluate what it needs. Tanya Sahu (2007) presents six general factors for consideration:

- **Technology**: Including dynamic vs static publishing, high load performance, security issues, and search engine ranking factors (static pages rank better).
- **Ease of use:** Most users are non-technical. Therefore, it is important to assess the ease of use of the end user content editing interface, the template-building interface, and the content approval system.
- **Total cost of ownership**: I.e. the costs in the long run, including maintenance and applications.

- **Cross Platform Support and Scalability:** Can it handle multiple operating systems? Can it integrate with other server-side technologies?
- **Web Presence Management:** The system should allow for the management of different websites separately and securely so as to manage multiple web presences (e.g. site on the intranet vs site on the extranet).
- **Solution deployment:** How long will it take to move content onto the content management system and how hard will the process be?

James Robertson (2003) stresses that the processes that surround the content management system are of most value to the management of knowledge. Apart from what has been already discussed, he emphasizes processes such as the restructuring and rewriting of content carried out by professional writers supported by experts. This not only improves the accessibility and presentation, but also points to content gaps.

As one can see, selection and implementation of a content management system is something that requires careful consideration. As with all KM related IT systems, the functionality must be weighed against organizational needs and processes as well as expected costs. If properly implemented, the content management system can be very beneficial to KM, by improving the quality of explicit knowledge, and providing limited support to tacit knowledge transfer by identifying content authors (i.e. experts) and supporting collaborative projects.

Document Management Systems

Document management systems, as the name implies, are systems that aid in the publishing, storage, indexing, and retrieval of documents. Although such systems deal almost exclusively with explicit knowledge, the sheer volume of documents that an organization has to deal with makes them useful and in some cases even mandatory. Often, they are a part of content management systems.

Usually, a document management system will include the following functions:

- **Capturing:** In order for paper documents to be useable by the document management system, they must be scanned in. For companies that need to carry out this process and who have numerous paper documents this may be time consuming and expensive.
- **Classification using metadata:** Metadata (data about data) is used to identify the document so that it can be retrieved later. It can include keywords, date, author, etc. The user is often asked to input this metadata, or the system may extract it from the document. Optical character recognition may be used to identify text on scanned images.
- **Indexing:** There are many different forms, and a good indexing system is crucial. The index function will use metadata.
- **Searching & retrieval:** The document management system's search function is one of its most important elements. Search functions can be more or less sophisticated, allowing for searches by elements of the document's metadata, or by searching the actual document for key words/phrases and using semantic analysis to determine relevance.
- **Versioning:** Storage and management of different versions of documents - useful for documents that require frequent updating. Allows authorized users to return to earlier versions.
- **Administration & security:** Any IT system needs to be regulated and policed. Users require different levels of authorization, with certain more sensitive functions/documents being available only to selected

users/administrators. Document management systems will also have backup systems in place in case of mishaps.

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Beyond this, they may include a whole host of possible features, including multiple platform support, multiple/customizable interfaces, workflow modules, file/format conversions, etc. Prices vary accordingly, and solutions should be carefully matched to organizational requirements. There is also an open source system called OpenKM that, despite its somewhat misleading use of the term "knowledge management", seems to have gathered a significant degree of popularity.

Compared to non-electronic systems, the document management systems offer reduced operational costs, improved efficiency and speed of retrieval, improved consistency, and more safety (both in terms of file backups and security measures). There are hundreds of systems out there, each with their own strengths and weaknesses. The points to consider are: purchasing/set up costs, types of features, training, upkeep, ease of use etc. Be sure to assess each one in light of your specific needs and your organizational processes.

Search & Categorization for Knowledge Retrieval

One of the most important aspects in sharing and retrieving knowledge and information using an IT system is the ability to find what you are looking for. The more data, information, and knowledge that is stored in our computers, in databases, across networks, in the cloud, etc. the more difficult it is to locate what we need, quickly and effectively.

XU et al (2011) indicated that knowledge retrieval is one of the biggest challenges today, and it is something that many IT systems try to address. There are several ways an IT system can contribute towards information and knowledge retrieval, including powerful search functions with filtering options and intelligent search tools.

Information systems can thus have any number of features. These may include searching across different types of media, query assistance, ranking, filtering, support of different indexation methods, search by keyword or search by relevance, supporting different languages, etc. Techniques used in knowledge and information retrieval range from simple keyword indexing/searching to advanced algorithms and neural models.

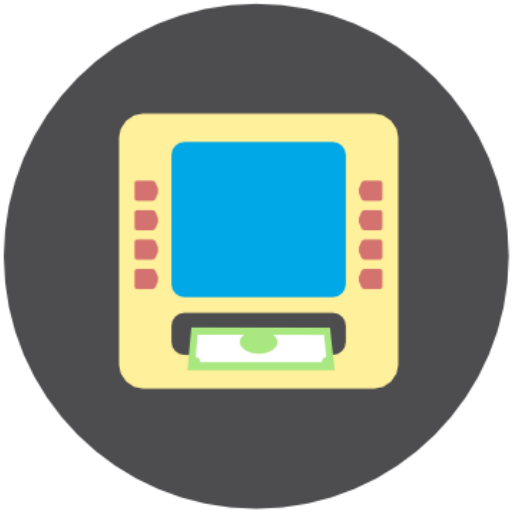
Babu et al (2012) identify several general steps in the information retrieval process:

- Indexing: Here the indexer must “capture” what the document is about. This may be done automatically through sophisticated processes designed to extract key information – something that spans beyond simple text and can include images, sound, etc. – or manually by the user (which may include user-specified keywords, descriptions, abstracts, etc.).
- Query formulation: “The query description is transformed, manually or automatically, into a formal query representation…” “…that combines features that predict a document’s usefulness. The query expresses the information need in terms of the system’s conceptual schema, ready to be matched with document representations” Babu et al (2012)

- Selection: This is where the results are presented to the user – with some form of ranking, grouping, etc. The user selects the results they need and may be involved in improving the search system. Relevance feedback, for example, is considered to be an important tool to improve selection. For instance, Hofmann et al (2015) describe the different metrics used to evaluate online user relevance, grouping them as document-level, result-list-level, and session-level metrics.

Information and knowledge retrieval systems can thus be independent systems aimed at better searching through knowledge and information repositories (e.g. search engines, specialized search software, digital libraries, etc.) or they can be built into intranet systems, document retrieval systems, content management systems, etc. They can employ a multitude of features, depending on the types of searches they are meant to perform, so as to provide the user with the most efficient and effective searches of knowledge and information repositories.

Knowledge Management Resources (Non-IT-Based)



Knowledge Management Resources and Techniques

In this section, I compile various resources and techniques that knowledge management (KM) practitioners can use to introduce KM and its supporting practices to an organization. I will focus only on non-technical knowledge management resources, as IT-based tools are discussed in the KM Tools and knowledge management systems sections. Those sections deal with actual IT based tools and the general implementation of systems respectively.

For now, I will look at the following non-technical knowledge management resources and techniques:

- Cross-functional project teams
- KM training & education
- Storytelling
- Mentoring

The subsections in this category have been kept intentionally brief, offering a general overview of the knowledge management resource in question. The goal is to provide the KM practitioner with an overview of the resources available to him. More segments will be added in the future.

If you landed on this page searching for a general resource guide to KM, you will be more interested in the site as a whole rather than this specific section. You can navigate to the relevant categories using the menus on the left or click "knowledge management" to be sent to the front page. As mentioned earlier, the site has a logical progression, moving from general definitions and supporting disciplines to models, strategy, and specific knowledge management resources and tools.

Cross-functional project teams

This basically refers to the practice of assembling project teams using members of the organization from different functions. Typically, this would involve selecting a number of specialists under a generalist project manager.

The role of project manager can be particularly demanding when using cross-functional project teams. Apart from being an expert at project management, the project manager must also have enough general knowledge to understand what his specialists know and how it can be used. The project manager must also be skilled at conflict resolution, which is more likely to happen within a diverse group.

As with all projects but perhaps more so for cross-functional project teams, proper planning is required, which involves clear definitions of the roles and responsibilities of the project team, as well as a timeline and cost estimation (Zoerman 2008).

Cross-functional project teams have several key benefits related not only to knowledge management (KM) but also to innovation. These are:

- Creation of new knowledge: Project teams have often been considered to be a particularly important source of new knowledge, particularly when they are given a certain degree of freedom and autonomy (Zoerman 2008, Nonaka & Takeuchi 1995, Peters 1988). Ideally, the project team should be self-organizing and be able to make its own project decisions. Using cross-functional project teams allows for the integration of a wider knowledge base into the project.
- Knowledge sharing across organizational boundaries: The team members work together during the project, enabling the transfer of all types of knowledge. In the absence of this kind of arrangement, often only explicit knowledge could be transferred, since these specialists would typically not socialize professionally.
- Support of the creation of informal knowledge networks: As we have previously determined, particularly in the section on communities of

practice, informal networks are a crucial part of organizational learning. Cross-function project teams bring people together from different parts of the organization, encouraging future collaboration and the expansion of personal informal networks.

Upon completion of a given project (whether carried out by a cross-functional team or otherwise), after-action reviews are used to enhance knowledge sharing and retention.

Knowledge Management Training

Consultancy:

This is almost always expensive, but it can be very useful. Trained consultants can work with all aspects of the organization, not just implementing KM processes but also educating the managers in the subject. Make sure to have a good grasp of what the consultant plans to do, and to emphasize the training aspect. Have local management be involved hands-on throughout the process, working with the consultants so as to pass on their tacit knowledge. Finally, give the consultants the freedom to do their jobs, understanding that knowledge management is a process that involves the entire organization.

A similarly broad definition is presented by Davenport & Prusak (2000), which states that KM "is managing the corporation's knowledge through a systematically and organizationally specified process for acquiring, organizing, sustaining, applying, sharing and renewing both the tacit and explicit knowledge of employees to enhance organizational performance and create value."

I will also choose to answer the question "what is knowledge management" in the broader perspective, encompassing not just the exploitation and management of existing knowledge assets, but the also the initiatives involved in the creation and acquisition of new knowledge. In the next article, I will arrive at a specific knowledge management definition.

Storytelling

Storytelling is a very old technique, dating back throughout most of human history. The practice is embedded into our culture; it was the primary form of family entertainment before the television (which is a different medium for story telling), it is mastered by competent politicians and journalists, and it remains as one of the most effective ways to reach someone and move them with your message.

Stories can be used to shape vision, to pass on knowledge and wisdom, and to shape identity and organizational culture. Storytelling is regarded as one of the most effective and influential techniques and has been documented extensively in numerous fields. Sole & Wilson (2002) identify the role of storytelling as follows:

- Share norms and values: Stories act as a medium for passing on values and creating vision.
- Develop trust and commitment: Personal stories can communicate one's own ability and commitment, as well as conveying openness by sharing something personal. Organizational stories influence the perceived trustworthiness of the firm and its management (either positively or negatively).
- Share tacit knowledge: Enables the users to articulate tacit knowledge and communicate with feeling, which helps them convey more than they realize that they know (Weaver 2005 in Bali et al 2009).
- Facilitate unlearning: Unlearning often requires more than rational arguments. It needs an intuitive and emotional anchor, which stories can provide.
- Generate emotional connection: We connect with stories emotionally and a story that has had an impact on us will be easily recalled long into the future.

Bali et al (2009) talk of the power of the narrative. The best narratives must have a beginning, middle, and an end. The more interesting and powerful, the more

likely it is that they will be remembered. Steve Denning (2000) adds a number of other characteristics of a good story, including:

- Focusing on the positive (a "happy ending") and conveying success stories.
- Having a "hero", and be told from that person's perspective
- Having an unusual plot - something that captures our attention.

The narrative can make use of more or less any verbal or written form of communication, as well as images, video, etc.

Liebowitz (2009) refers to storytelling as the organization's oral histories. According to him, stories can capture knowledge and routines of the past, enabling workers in the present to adapt it to the new conditions.

Offering more specific guidelines for using stories is impossible, since they will each depend upon the context of the organization. However, management should be aware of their importance and influence, and of their potential as a change agent.

One example of the way storytelling is managed is offered by Jeff Hester (2011). He outlines an example of how storytelling is used successfully at Fluor. One of the formal techniques employed by management aims to collect stories from the employees through a form that respondents fill out. In it, they are asked to share their success stories, describing why they consider it a success and what value it generated (Hester 2011).

Stories can thus be organizational - capturing history, culture, wisdom, etc.- or they can be leadership tools. For the latter, it is used by the leader to achieve a desired effect. Sole & Wilson (2002) offer a few considerations for the use of storytelling in this way:

- Be clear on why you are telling it
- Keep it simple and accessible
- Try using more than one medium
- Monitor how the story is received
- Hone your story-listening skills

Callahan (2018) emphasizes that many times what organizations refer to as stories are really non-stories. For instance, a manager talking about the company’s position and vision is not a story, neither are opinions, statements, etc. A key skill

is therefore the ability to spot and tell a true, effective story. According to Callahan, the impact of stories can be described as:

- A story describes what happened
- A good story helps you see what happened
- A great story helps you feel what happened

Mentoring

Mentoring is one of the most effective ways of passing down tacit know-how from an expert to an aspiring expert. This practice dates back throughout human history and is just as relevant today.

Mentoring is about practice under the guidance of an expert. Unlike classroom learning, the apprentice or mentee is given practical tasks, under the supervision and guidance of his mentor.

Liebowitz (2009) refers to formal mentoring programs as a well-established way to retain and transfer knowledge. He highlights an example from the NASA Goddard Space Flight Center, where the mentoring program runs for a year, and includes assignments, meetings, formal mentor training, assessment, etc.

Mentoring can be implemented both formally (as above) and informally. Informal mentor relationships could involve assigning a guide to a new employee, or simply encouraging him to seek out a mentor. For the most part however, organizations are beginning to look at formal relationships designed to train the newcomer as quickly and effectively as possible.

The characteristics of an ideal mentor are (based on the work of Clutterbuck 2001 and Heathfield 2011):

- Personal expertise
- Familiarity with the organization: its procedures, culture, etc.
- Desire to teach/guide
- Ability to motivate
- Ability to allow for personal development of the mentee: Must accept different approaches and offer his own advice as an alternative not a mandate.
- Commitment: time, resources, persistence, etc.
- Skilled communicator

- Ability to remain professional: includes the ability to realize when the mentoring relationship has run its course and/or when it is no longer functioning
- Self-aware and self-critical
- Ability to foster trust

Mentoring is a key process for knowledge management. Apart from transferring tacit knowledge and retaining expertise within the organization, it can also help the mentee to become a recognized and accepted member of the community, by passing on corporate vision and values and improving his grasp of corporate networking (Clutterbuck 2001). Companies should therefore consider implementing formal mentoring relationships and mentor training as an investment in the future knowledge stock of the organization.

Knowledge Management Failure

Knowledge Management Failure Factors

In 2013 and 2014, I tried to synthesize the knowledge management (KM) failure factors that have been discussed in cases and studies for the last 10 years or so. This resulted in an article that I am currently offering for free from this site. You can download it by clicking this link. This section and the articles within it are based on that paper (though without the same level of detail).

It is fair to say that the history of KM has been a very bumpy one. Over the years, KM initiatives have been associated with countless failures, making many companies and executives very apprehensive at considering implementing such a program.

The Issue of Definition

In order to understand how these knowledge management failures came about and how they could be prevented, it is important first to understand the ambiguity that surrounds our entire discipline. There are several factors that come into play here:

- What is KM exactly? Sadly, there is no correct answer to this question, and there is virtually no consensus on what KM actually is. Part of the problem is that there is little consensus on what knowledge is, and this makes KM a very ambiguous concept. For instance, some views, which regard knowledge as virtually synonymous with information, would consider a "KM" initiative to be something much shallower and technology driven.
- What is failure exactly? Failure and success are inextricably linked to expectations. You can only fail when you fall short of where you wanted to go. KM went through a buzz-word phase at the turn of the century and during that time expectations were sky high. So whenever one assesses failure, it is always important to ask if the expectations where realistic to begin with.

The reason I mentioned the above is because whenever someone talks of KM failing or succeeding, it is very important to understand what exactly they mean by

KM and what exactly they expected from it. For this reason, the first article in this section deals with the problem of a lack of universal definition of KM.

KM Failure Factors

Based on the works of numerous researchers and authors, I arrived at two categories of factors, namely "causal" and "resultant".

Causal factors refer to fundamental problems within the organization, which lead to conditions that are not suitable for KM. They are not always easily visible, and they lead to a number of symptoms, which I have termed “resultant” factors.

Below I have included an overview of these factors. For each of these points, there is substantial empirical evidence as well as theoretical deliberations linking them to KM failure (and conversely, to KM success). Please note that these factors are not listed in order of importance, nor does anyone causal factor correspond to a specific resultant factor.

Causal Failure Factors:

- Lack of performance indicators and measurable benefits
- Inadequate management support
- Improper planning, design, coordination, and evaluation
- Inadequate skill of knowledge managers and workers
- Problems with organizational culture
- Improper organizational structure

Resultant Failure Factors:

- Lack of widespread contribution
- Lack of relevance, quality, and usability
- Overemphasis on formal learning, systematization, and determinant needs
- Improper implementation of technology
- Improper budgeting and excessive costs
- Lack of responsibility and ownership
- Loss of knowledge from staff defection and retirement

No Universal Definition of Knowledge Management

Before discussing specific failure factors, I want to touch upon an issue that KM has faced since its conception: the lack of a commonly accepted definition. Although this is not usually listed specifically as a failure factor, it is widely recognized as a problem within the field and it is something that affects every study, discussion, or recommendation within KM.

According to Michael Sutton (2007: 1):

KM does not appear to possess the qualities of a discipline. If anything, KM qualifies as an emerging field of study. Those involved in the emerging field of KM are still vexed today by the lack of a single, comprehensive definition, an authoritative body of knowledge, proven theories, and a generalized conceptual framework.

There are a couple of reasons for this. First, there is little consensus regarding what knowledge actually is (Mika, 2004:1). Some regard knowledge as being virtually synonymous with information, while others incorporate concepts such as experience, know-how, know-what, understanding, values, etc. At the risk of generalization, the former approach tends to be more common in IT dominated circles while the latter is more prevalent in business management literature.

Second, KM has a wide range of contributors from different fields, industries, and so on, which further perpetuates different understandings of what the term actually means. Onyancha and Ocholla (2009: 2) identify the following disciplines as being the greatest contributors to, or users of KM: computer science, business, management, library and information science, engineering; psychology, multidisciplinary science, energy and fuels, social sciences, operation research and management science, and planning and development.

To illustrate some of the differences in the definition of KM, compare the following three definitions with the one I selected for this paper in the previous section:

- GMI Market Research Terms (2013): Knowledge management *"is a system that affords control, dissemination, and usage of information".* This is often a Net-enabled corporate initiative.
- "Knowledge Based Solutions, Definition of Terms (2002): *"Knowledge Management is a set of processes used to effectively use a knowledge system to locate the knowledge required by one or more people to perform their assigned tasks."*
- Skyrme (2011b*): "Knowledge Management is the explicit and systematic management of vital knowledge - and its associated processes of creation, organisation, diffusion, use and exploitation - in pursuit of business objectives."*

I chose these three definitions because they represent largely incompatible views. In reality, I could have selected from literally dozens and dozens of KM definitions, all of which regard the discipline somewhat differently.

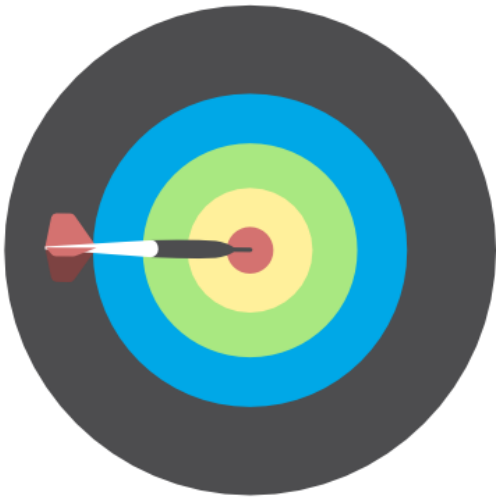
Looking at the definitions above, the most striking aspect should be that definition 1 does not even mention the word “knowledge”. According to that definition, KM is an information focused technological discipline. It should also be apparent that definition 2, although more nuanced than definition 1, is still far narrower in scope and far more technology-dependent than Skyrme's definition (no. 3), while at the same time also lacking the strategic element that Skyrme implies through the term "vital" knowledge.

The problem with a lack of a common definition is that each KM initiative could, in theory, have widely different goals, scope, and success criteria. The differences are so great that to even talk of KM failures or successes is potentially misleading. Moreover, if there is a lack of understanding as to what knowledge or KM represents within the firm itself, it is easy to see how problems, misunderstandings, and widely different expectations could arise.

Therefore, when dealing with KM, keep in mind that before when you are faced with results, advice, theories, etc. it is imperative to first understand what the author meant by knowledge management. Secondly, whenever you deal with KM in your organization, make sure everyone is on the same page as to what KM is and hopes to achieve.

To learn more, feel free to download the paper on Failure Factors in Knowledge Management from the right-hand column.

Knowledge Management Careers and Skills



Careers in Knowledge Management

In this section I am going to take a look at what one needs to pursue a career in knowledge management. Below I will start by talking a bit about the kind of KM educations and courses one can find from a general perspective. In the other subsections I will take a look at the positions that are available within this field and then at the skills that are required for a knowledge management career.

KM Programs

KM can be taken as a standalone discipline or as part of a broader education. KM courses and certifications exist at all levels, though it is usually taken as a graduate level subject. As with all subjects, the depth of the course will affect the kind of position that you are qualified for within the spectrum of KM-related positions (see "Knowledge Management Positions and Roles"). The types of educations that might include KM (but not mention it in the title) typically deal with subjects such as innovation, IM, technology management, intellectual capital, and so on.

Generally speaking, KM programs tend to have either a managerial/business or an IT focus. Since KM is now inextricably linked to technology at least to some degree, there will be a certain degree of overlap; however, the educational programs available in the various institutions do tend to have a "business school" or "IT school" focus. Similarly, positions in companies often reflect this. This means that some programs will focus more extensively on the details of KMS architecture, the design/implementation of expert systems or intranets, and so on, while others will focus more on the tacit nature of knowledge, on organizational culture issues, and on the management of people & teams.

Whichever kind of program you choose, it is important to remember that even though technology is an important part of KM today, it is never a solution in itself and it should be used carefully as part of a broader KM strategy.

Knowledge Management Positions and Roles

In this section, I will provide an overview of the knowledge management roles that one may find in a company. It is important to note that different companies may have some, all, or none of these positions. Furthermore, many will be part time roles (Skyrme 2011), representing a portion of an employee's/manager's responsibilities; this can even be the case for a top position like a CKO (Ning 2006). Alternatively, multiple roles may be integrated into one position, or the knowledge management responsibilities may be a part of more general functions (e.g. an intellectual capital manager, an information worker, etc.).

However, these are the general roles that one can expect to fulfill in one capacity or another if one pursues a career in KM.

Chief Knowledge Officer (CKO) / Chief Learning Officer (CLO): This represents the highest position within the field of KM. The CKO or CLO is responsible for the overall strategy, planning, and implementation. The CKO or CLO will be responsible for (Rusonow 2003 in Dalkir 2005):

- Formulating KM strategy.
- Handling KM operations.
- Influencing change in the organization.
- Managing KM staff

Due to the importance of this position, the required knowledge and skills of the CKO (or CLO) are specifically addressed in the section on Knowledge Management Skills.

Knowledge Manager: This is a general term for an executive who works with the CKO to implement knowledge initiatives and who manages KM efforts (Department of Navy, CIO). Examples of projects undertaken by knowledge managers include strategizing KM and change management, taxonomy construction, social network analysis, etc. (Ning 2006).

KM Champions / Knowledge Leaders: Promote KM in an organization (Dalkir 2005), often by championing specific initiatives, e.g. re-designing the intranet, facilitating communities of practice, constructing taxonomies, etc. (Ning 2006).

Knowledge Navigators / Knowledge Brokers: Someone who knows where knowledge is located (Dalkir 2005) and who connects people with knowledge to those who need it (Skyrme 2011).

Knowledge Synthesizers / Knowledge Stewards: This role is responsible for keeping knowledge up to date (Skyrme 2011) and recording significant knowledge to organizational memory (Dalkir 2005).

Knowledge Editor: Someone who manages the format and language of explicit knowledge so that a user can more easily utilize it (Skyrme 2011).

Knowledge Analyst: Someone who translates user needs into knowledge requirements (Skyrme 2011).

Knowledge Transfer Engineer: Captures and codifies tacit knowledge so as to facilitate its reuse. Also facilitates the transfer of tacit knowledge by connecting relevant people (Department of Navy, CIO).

Knowledge Systems Engineer: This is a systems expert who creates solutions for KM initiatives through the use of portals, intranets, databases, and so on (Department of Navy, CIO).

Apart from this, you have a whole host of positions involved directly or indirectly within KM, including everything from content publishers, human resource roles, mentors, librarians, etc. (Dalkir 2005). In some capacities, such positions may receive a designation which includes “knowledge management”, e.g. knowledge management assistant.

The roles and positions outlined above are not exhaustive; there are countless other ways to organize and name the KM functions. However, they should cover the main responsibilities of KM workers and managers.

Knowledge Management Skills

In this section I will draw upon several sources to outline the skills necessary for a career within knowledge management. Evidently, different positions will emphasize different aspects of KM, with leadership positions requiring a great ability to manage, influence, and organize, while technical positions would focus more on IT skills (relatively speaking). Over the years, there have been several approaches to defining these skills from various perspectives. Below I will talk first about the skills of the knowledge worker and then specifically of knowledge managers and the CKO or CLO (henceforth referred to as the CKO).

The Skills of Knowledge Workers

On a very general level, Mohanta (2010) identifies six characteristics that all knowledge workers need to some degree:

- Possessing factual and theoretical knowledge
- Finding and accessing information
- Ability to apply information
- Communication skills
- Motivation
- Intellectual capabilities.

This provides a foundation for understanding the basic knowledge management skill set, but it does not include the skills needed for more specialized positions, e.g. within management or IT systems.

For this we turn to the knowledge management skills map presented by TFPL (2000). TFPL is a UK-based recruitment, training, and consultancy company for the knowledge, information, and data industries. Their knowledge management skills map is the result of an extensive survey of over 500 organizations. According to their research, they defined the following general categories, each consisting of a large set of skills:

- **Strategic & Business Skills:** Includes business planning, industry knowledge, strategic thinking, leadership, and organizational skills.
- **Management Skills:** Includes business processes, people management, process mapping, team building, and measurement.
- **Intellectual & Learning Skills:** Includes problem solving, mentoring, conceptual thinking, being analytical, and the ability to deal with ambiguity.
- **Communication and Interpersonal Skills:** Includes listening, negotiation, marketing, team working, and consulting.
- **Information Management Skills:** Includes codification, content management, information processes, taxonomies, and IT applications.
- **IT skills:** Includes database management, information architecture, programming, software applications, and workflow.

Depending on the specific KM position, some of these skills will be emphasized ahead of others. For example, according to TFPL, a knowledge worker would rely more heavily on communication & interpersonal skills and thinking & learning skills, while requiring least ability within management. By contrast, a CKO would require little skill within information management and IT, and high skills in the other categories (particularly within strategic & business skills).

Another useful skill is identified by Skyrme (2011), who notes that "knowledge networking" is considered a key ability for their KM team members. Knowledge networking is explained as the ability to connect with people and continuously expand one's networks to include other knowledgeable persons.

Knowledge Managers and the CKO

McKeen & Staples (2002) conducted a survey of 41 knowledge managers and from it they created a tentative portrait of the knowledge manager:

- Highly educated
- Already a seasoned organizational performer. Chosen for KM based on proven performance.
- Seeks new knowledge
- Likes "being at the forefront of something new and exciting"
- Derives more motivation from a challenge than from formal power

- Receives intrinsic rewards from helping others
- A risk-taker
- Sees KM as a way to "make a mark within the organization".

Looking more closely at the CKO, TFPL regard the most important characteristics of a CKO to be first and foremost strategic & business skills, followed by thinking & learning skills and communication & interpersonal skills. Baren 2011 offers a similar though more specific perspective, by identifying five core areas within which CKOs should possess as many skills as possible:

- Knowledge Management Experience
- Learning Industry Experience
- Technology Project Management
- Matrix Management Skills
- Industry Subject Matter Expertise

Again, the emphasis is on very strong management skills, though with certain specializations. For instance, in his experience within technology management, the CKO should have rolled out new solutions and acted as a liaison between business and technology. His matrix management skills should include enabling cross-functional teams and being comfortable in a "matrix reporting environment" (Baren 2011).

This concludes this article on knowledge management skills. Hopefully, it should have helped shed some light on the type of skills required by knowledge workers, and particularly on what constitutes a competent knowledge manager and/or CKO.

References

Below you can find my list of sources for the work presented on this book.

First, for those of you interested in reading more on this, I particularly recommend:

Botha et al. (2008): The book is in two parts. The first presents a very concise and in-depth overview of knowledge management (KM), organizational learning, organizational memory, organizational culture, and so on. The second part offers one of the most in-depth looks at knowledge management systems that I have ever seen in a KM book.

Liebowitz (2009): A short book focused on knowledge retention. It offers many interesting case studies, taking a more practical oriented approach than other texts.

There are many noted authors that I did not list above (e.g. Brown & Duguid's contribution to communities of practice) since I was trying to point the reader in the direction of more general KM texts.

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